Electrical Review

WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT

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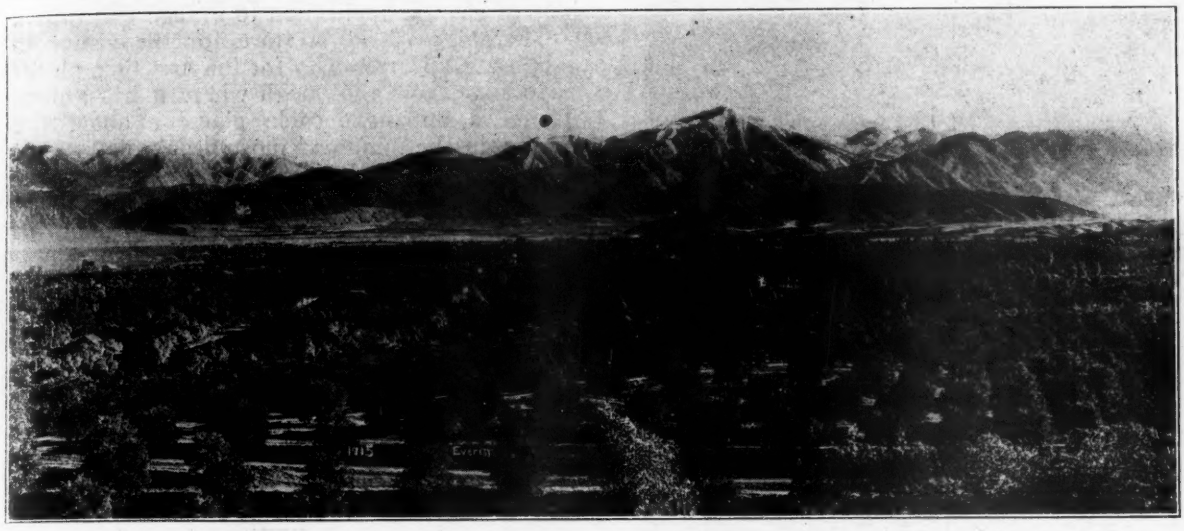


San Gabriel Valley Where the Snow-Capped Mountains Provide Hydroelectric Energy for Irrigation Through Motor-Driven Centrifugal Pumps.

Electricity Proves Aid to Orange-Growing Industry

Delegates to National Electric Light Association Convention in Pasadena in May Will Find Electric Power in Universal Use Through Southern California for Irrigation and Other Purposes

It seems rather a strange, not to say startling, statement to make, but it is true nevertheless that delegates and visitors to the coming national convention of the National Electric Light Association will be very much interested in orange growing.

The connection between men of the electrical industry and orange growers may seem obscure, but when one gets down to real facts were it not for the electrical industry the wonderful orange-growing development of the San Gabriel valley and other sections of southern California would still be in a very primitive state, if orange growing were possible at all.

Pasadena, Cal., where the annual convention of the National Electric Light Association will be held May 18 to 21, inclusive, is in the very center of the orange-growing district and is sometimes called the "City of Oranges."

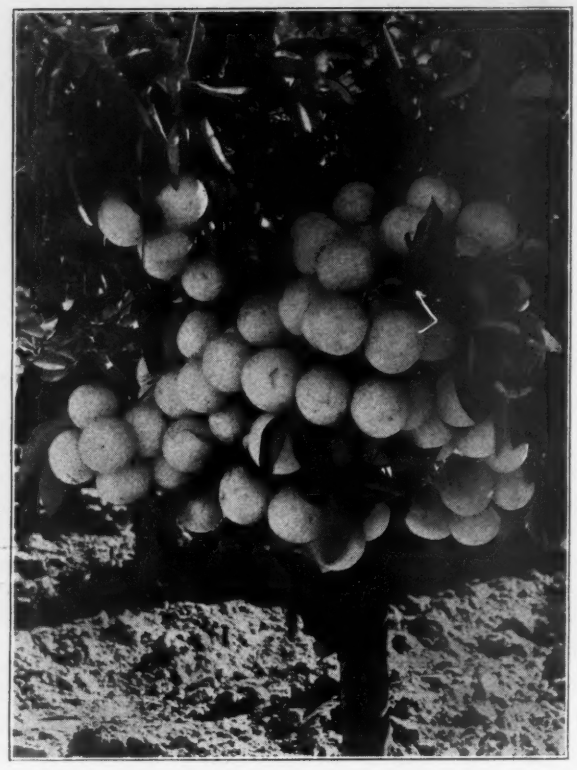
ELECTRIC POWER WIDELY USED.

Hardly one in a hundred men connected with the electrical industry has any conception of the part electric machinery plays not only in aiding in the actual growth of the luscious California orange, but in getting it ready for market and shipment after it has been plucked from the tree. And this electric aid extends further than oranges, for it includes grapefruit, olives, beet sugar and in fact all products produced from the soil of southern California.

Hence it is safe to say that the delegates and visitors to the coming national convention, whose primary interest is electricity, will also be greatly interested in oranges and other citrus products of California.

In the large photographic cut shown herewith is depicted the San Gabriel valley with an orange grove under cultivation while in the background are the snow-capped peaks of the Sierra Nevada range which provide what the French call the "white coal"—the hydroelectric energy for the irrigation of the orange groves. In another illustration accompanying this article is a scene during picking time, while in a third is shown a cluster of the orange's "big brother," grapefruit, just about ready to be plucked.

In southern California practically all of the land used for growing any sort of crop is under electric irrigation. Lands that were once semi-



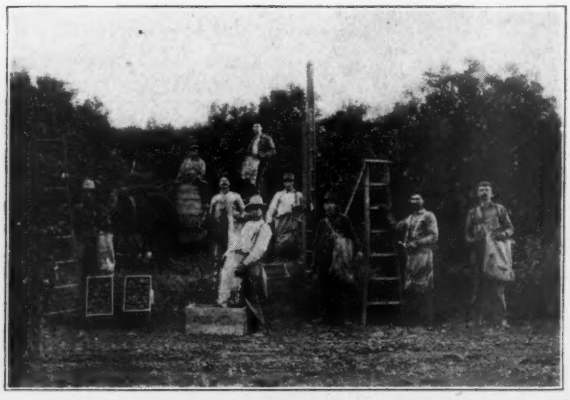
A Cluster of Grapefruit in an Electrically Irrigated Grove in Southern California.

arid pastures for bands of sheep, herded by the younger monks of the Franciscan missions, have been brought under intensive cultivation by the electrically driven pump, which year by year is reclaiming the desert, and covering the waste spots with rich green foliage and producing luscious fruit.

All Electrically Operated.

From a load-factor standpoint, irrigation of the great orange groves and other citrus-growing plantations will be of great interest to electrical men, but electric pumping is but one feature of the use of electrical energy in the orange industry.

The orange packing-house is today operated entirely by electricity. The fruit is washed by electrically driven washers. Then the brand label is placed on it by another electrical device. The orange then finds its way into the electric sorter, in which the oranges are graded for the market. Even the boxes are made and nailed up by



Picking Oranges in the Electrically Irrigated Orange Groves in Southern California.

electrical machinery, and in some of the largest packing houses there are many labor and time-saving devices, which get their power from electric motors.

Tours of the orange groves are being prepared for the convention delegates and visitors, and men familiar with the orange industry will accompany the visitors and point out the practical side of electric application to orange cultivation.

There is a thrill in store for the visitor to southern California who for the first time plucks an orange from the bough where it has grown. There is an inexplicable glamour about the orange in the minds of most people that seems to make the actual picking of one from a tree an epoch. This is probably due to the fact that the orange has always been regarded, more or less, as a luxury rather than a staple food.

The orange has been the theme of poets and the inspiration of painters for hundreds of years, but visitors to the southern California groves in May will discover that in the year 1920 the orange is peculiarly the protege of electricity.

KANSAS ENGINEERING SOCIETY PROTESTS POSTAL RATES.

Adopt Resolution Against Regulations Which Cause Increase in Postage Cost.

At the annual meeting of the Kansas Engineering Society held in Manhattan, Kan., Jan. 20 and 21 last, the society went on record as being opposed to recent regulations of the post office department increasing postal rates, pointing out the fact that the regulations will have the effect of increasing materially the subscription rates of engineering and technical publications.

The resolution in full follows:

Whereas, certain regulations of the United States Post Office Department which have recently gone into effect have the result of increasing materially the subscription rates to engineering and other technical publications received in large quantities by engineers in the central states west of the Mississippi River; and

Whereas, such publications have a distinct and important educational function contributing to the successful development of industries and public enterprises in this section of the country; and

Whereas, such post office regulations serve to place a handicap upon the engineering profession in this region; therefore be it

Resolved by the Kansas Engineering Society in annual meeting assembled at Manhattan, Kan., Jan. 20-21, 1920, that the Post Office Department be requested to modify said postal regulations insofar as they affect standard publications issued by regular publishing houses on an established subscription basis; and be it further

Resolved, that copies of this resolution be forwarded to the Postmaster General in Washington, to senators and representatives in Congress representing the state of Kansas, and to publishing houses of established periodicals in accordance with a list to be prepared by the Executive Committee of the Society.

Engineering organizations in other states plan similar resolutions.

Maintenance of Interior Lighting Systems

Importance of Proper Attention to Maintenance—Depreciation of Lamps, Reflectors and of Surroundings — Need for Systematic Cleaning and Lamp Upkeep—Study of Maintenance Costs

By A. L. POWELL

Illuminating Engineering Department, Edison Lamp Works of General Electric Co.

The proper maintenance of lighting equipment is a very important factor in illumination. The housewife, for example, realizes that the home would soon become a very poor place in which to dwell unless she made periodic house cleanings and attended to the household duties in this respect from day to day. The industrial plant, or office, would soon become unsanitary unless the scrub people were employed. On the other hand, lighting equipment is often neglected from the time it is installed until it becomes obsolete. Persons seem to believe that after once hanging a fixture and screwing a lamp into a socket no further attention needs to be given to this part of the home or office. A widespread campaign of educating the public in this respect is most essential and it is up to everyone interested in lighting to preach the gospel of proper maintenance. The electrical contractor, when he has finished an installation of lighting, should not leave the job without advising the customer as to the necessity of cleaning. To quote a prominent official of the Department of Labor of an important industrial state, when addressing the annual convention of electrical contractors and dealers:

"If you sell a man a motor, you usually give him an instruction card telling him how to oil the motor, adjust the brushes, and the like. If you did not do this and he did not attend to the matter through his own appreciation of the subject, the motor would soon stall, burn out and you would be justly blamed. On the other hand, many a lighting installation is sold with no instructions or suggestions as to its maintenance.

"A lighting system demands careful maintenance. If it does not receive it, the intensity will soon drop so low that the men cannot see to perform their work. You will get the blame. You will be told that the installation you designed and installed is not adequate for the purpose. Your engineering judgment will be criticized."

Depreciation of Lamps.

Inherent.—As the Mazda lamp is burned small particles of tungsten are evaporated from the filament and collect on the lamp bulb in the form of a dark deposit. With the Mazda "C" lamp the gas current carries these particles to the upper part of the bulb, where they have less effect in absorbing light than when deposited directly opposite the filament. Nevertheless, any accumulation on the interior surface of the bulb absorbs light, and blackened lamps should, of course, be replaced. It is comparatively simple to figure out the most economic point at which to remove lamps from the socket, taking into account the price of lamps and the cost of current. For average conditions, when the candlepower has depreciated to between 75% and 80% of initial rating the lamp should be discarded. Of course, a photometric test might be desirable to determine exactly the percentage of depreciation, but observation and experience will soon indicate to the maintenance department when a lamp has depreciated to approximately this value. The Mazda lamp is designed to maintain its candlepower above the limits just mentioned for an average life of 1000 hours burning and at the end of this period should be removed and discarded if the most economic conditions are to prevail.

Acquired.—Not only does a black deposit gather on the inside of the lamp bulb, but dust collects on the outer surface; flying particles of oil, or similar materials, are also deposited here. This accumulation cuts down the light from the lamp and should be removed at the time reflectors are cleaned. This is often more serious than realized.

As a concrete case, we might quote a test on some lamps which were installed in a grinding room, where the air was moist and ladened with steel dust particles. Half of the lamps installed for the test were removed at the end of a week and the remainder at the end of three weeks. The lamps were taken to the photometric laboratory and tested. Those with a week's accumulation of dirt showed an average absorption of 16%. Those removed at the end of three weeks had an average absorption of 23%. This does not take into account the loss of light which would occur due to the grease and dirt on the reflector. Putting this in other words, at the end of a week an increase of over 16% in wattage, and at the end of three weeks nearly 23% increase in wattage, would be required in order to obtain the same illumination as secured when the lamps were clean. Of course, many conditions are not as severe as this and some, for example, the foundry or large shop, are even more severe.

Another important point, in regard to the lamp, is the question of having lamps of the proper voltage in use. While initially the installation may be correct as to voltage, on replacing or ordering additional lamps an error may be made in specifying the voltage of these lamps. Mazda lamps are designed to operate

most economically at the voltage indicated on the label. This rating takes into account renewal and energy costs. If the circuit voltage is appreciably higher than the label voltage, short life of lamps will result. If the voltage at the socket is considerably lower than that indicated on the label of the lamp in use, it will not emit the proper quantity of light. To make up for this loss of illumination, it would be necessary to install additional lamps. For instance, 7 Mazda lamps operating at rated efficiency will give the equivalent amount of light of 8 Mazda lamps operating 4 volts below the rated efficiency of the lamps. Before ordering lamps it is desirable to determine what average voltage is actually attained at the socket. Where the voltage of the system fluctuates during the day, or where it varies in different parts of the installation, it is proper to order lamps as near the average of this variation as possible.

Depreciation of Reflecting Equipment.

All lamps and reflectors should be regularly washed and cleaned. The period between cleanings will vary with locality and type of equipment. Obviously, a steel direct-lighting reflector will not depreciate as rapidly as an indirect unit. In the case of the former the under surface of the reflector offers very little opportunity for dust to gather, and that on the lamp bulb will be the primary cause of loss. In the case of the inverted unit, however, a thin layer of dust soon settles on the entire reflecting surface as well as on the lamp, which will reduce the light output appreciably in a very short time. Not only is this true, but the very arrangement of parts makes the accumulation greater. With the direct lighting equipment the reflector itself shields the lamp from falling particles, while they enter directly into the inverted unit.

A table is given herewith representing the approximate loss of light for various lighting systems, based on average office conditions in an industrial city. For some other locality, other figures will apply. The country town will have less depreciation than the busy city. The figures presented, however, are fairly typical of average conditions. It can be seen that the steel reflector depreciates least, while the opal reflectors for direct lighting vary as to the density of the reflector. This is to be expected, considering that with a light-density unit, more light is transmitted through the glassware and dirt on the outer surface will have appreciably more effect.

Another feature enters in comparing direct and indirect systems. With direct lighting, the dirt gathers on the exterior surface and is readily visible to the occupants of the room. With the semi-indirect and totally indirect system, the dirt gathers on the inner or reflecting surfaces and, as a rule, is not noticed until conditions become so aggravated that the illumination drops far below that intensity for which it was designed. Hence, a specially careful maintenance of any indirect system is extremely important if proper lighting is to be obtained.

Depreciation of Surroundings.

The question of color of walls and ceilings is very important. No matter how carefully painted a room may be, soot, smoke and other agencies soon darken the surfaces of the room and cause it to lose considerable of its reflecting power. Any porous paint, such as calcimine, or whitewash, is particularly susceptible to this effect. In industrial localities it is frequently necessary, if maximum economy of lighting is to be obtained, to paint the ceilings every year and a half and side walls every three years. A test, to determine the reflection coefficient of the ceiling and walls, at frequent intervals may save considerable on the lighting bill. In general, paint is far cheaper than electrical energy and in dirty plants painting or cleaning is especially important.

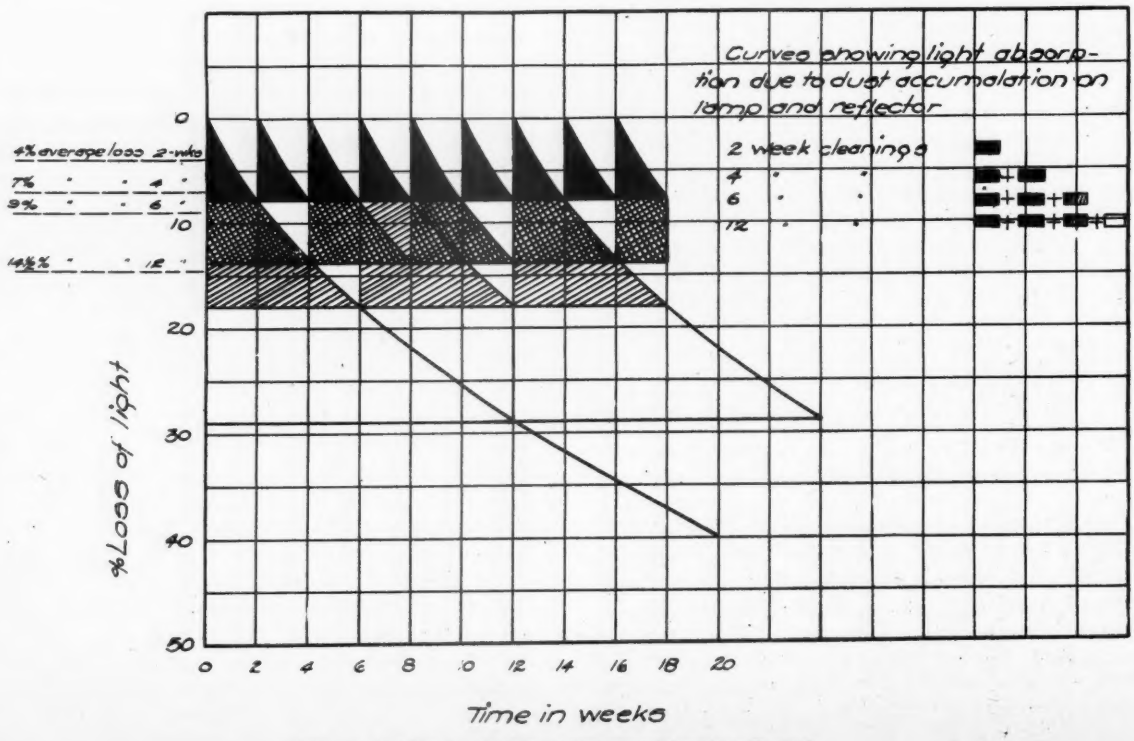


Fig. 1.—Light Losses for Different Cleaning Periods.

Haphazard cleaning has not usually been found satisfactory, since the accumulation is so gradual that it is not readily noticed by those responsible. Much better success has been secured by organized cleaning, at stated intervals, under the charge of a maintenance department where one person is absolutely responsible for this. As pointed out before, the periods between cleaning will vary with the locality and with the equipment. Considering average conditions and typical equipment, the fixtures in an office should be wiped clean at least once every month, and removed for careful washing once every three or four months. Taking the other extreme, in the foundry it is probably necessary to carefully clean fixtures once each week.

System of Cleaning.

The cost of cleaning again varies with the type of equipment and labor charges. As typical figures, for industrial plants with direct lighting reflectors, from three to five cents per cleaning might be considered as average. Some figures obtained in a large office building where semi-indirect units of a fairly simple design are in use indicate that the cost for cleaning by wiping lamps and reflectors with a damp cloth and then drying is approximately five cents per unit. Removing the semi-indirect bowl from the fixture and carefully washing costs approximately 10 cents. The most economic period for cleaning a given installation can be obtained by taking into consideration the cost of power, the burning hours per day, the loss of light due to the accumulation of dirt, and the cost per cleaning. The calculation is not involved, as indicated by the following example:

Use the figures of light depreciation as given in the table, costs of cleaning as quoted above for semi-indirect units, and a power cost of five cents per kw-hr.; the average burning hours per day are assumed as 6, and 200-watt lamps in use.

For a 12-week period, the following calculations apply:

Total kilowatt-hours consumed = (6 hours × 6 days × 12 weeks × 200 watts) ÷ 1000 = 86.4 kw-hrs.

Case A—Fixtures wiped every 2 weeks, washed every 12 weeks.
Cost of cleaning, 5 + 5 + 5 + 5 + 5 + 10 = 35c.
Equivalent power loss, 4% (from curve) or 86.4 × 0.04 = 3.45 kw-hrs.
Cost of lost energy, 3.45 × $0.05 = $0.173.

Case B—Fixtures wiped every 3 weeks, washed every 12 weeks.
Cost of cleaning, 5 + 5 + 5 + 10 = 25c.
Equivalent power loss, 5½%, or 8.64 × 0.055 = 4.75 kw-hrs.
Cost of lost energy, 4.75 × $0.05 = $0.24.

Case C—Fixtures wiped every 4 weeks, washed every 12 weeks.
Cost of cleaning, 5 + 5 + 10 = 20c.
Equivalent power loss, 7%, or 86.4 × 0.07 = 6.05 kw-hrs.
Cost of lost energy, 6.05 × $0.05 = $0.30.

Case D—Fixtures wiped every 6 weeks, washed every 12 weeks.
Cost of cleaning, 5 + 10 = 15c.
Equivalent power loss, 9%, or 96.4 × 0.09 = 7.8 kw-hrs.
Cost of lost energy, 7.8 × $0.05 = $0.39.

Case E—Fixtures washed every 12 weeks.
Cost of cleaning = 10c.
Equivalent power loss, 14½%, or 86.4 × 0.145 = 12.5 kw-hrs.
Cost of lost energy, 12.5 × $0.05 = $0.625.

The shaded areas in Fig. 1 represent the energy loss for the different cleaning periods, while Fig. 2 shows graphically the results from the above calculation. The two curves are seen to cross at a point slightly beyond the three-week period; therefore, any cleaning period greater than this value represents an actual loss indicated by the distance between the two curves for the particular conditions under consideration.

Method of Cleaning.

For dry dirt, wiping with a dry cloth or brush, then with a damp cloth, and finally drying all surfaces, will prove satisfactory. Greasy or

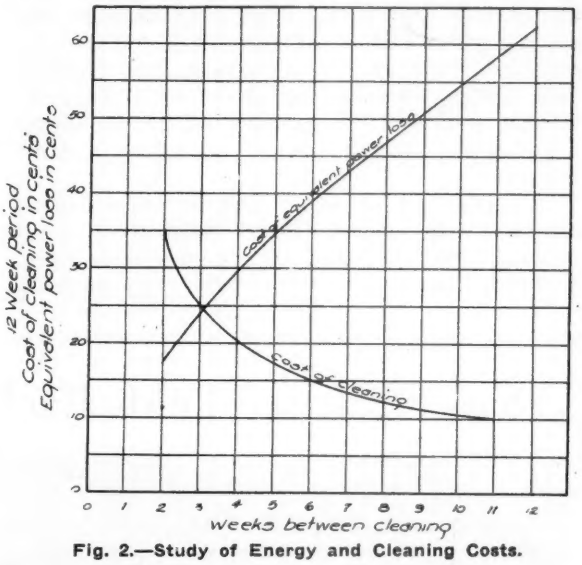


Fig. 2.—Study of Energy and Cleaning Costs.

wet accumulations on any type of reflector must be removed by washing. Soap and water are good agents, but care must be taken to remove the film of soap by rinsing thoroughly, as dried soap accumulates dust very rapidly. There are a number of cleaners on the market, but before these are used on a polished surface care should be taken to see that they are so smooth as not to make microscopic scratches on the glass, and they should not leave a film of cleaning material. Most of these may be applied with a piece of cotton waste or soft cloth and polished off with dry waste or cloth. Where lamps are hung high,

APPROXIMATE LOSS IN PERCENTAGE OF INITIAL ILLUMINATION ON WORKING PLANE.

Lighting System.	4 weeks	8 weeks	12 weeks	16 weeks	20 weeks
RLM standard dome	5	8	10	12	14
Dense opal bowl direct	7	10	13	16	19
Prismatic bowl direct	9	13	16	19	22
Light-density opal bowl direct	12	18	24	28	30
Semi-indirect	14	22	29	35	40
Totally indirect	20	29	37	44	50

and it is necessary to use a ladder to reach them, it is advisable to have on hand an extra globe, or reflector, which may be put in place of the dirty globe, and the latter carried to the cleaning place. After washing, the clean globe can be substituted for the next dirty one, and so on. This procedure necessitates only one trip up the ladder for each globe or reflector.

Many a splendid lighting installation proves unsatisfactory due to lack of attention. It has often been the experience of the writer that even when designing and supervising a lighting in-

stallation and leaving instructions as to maintenance, in a few months a complaint would be received that the intensity was inadequate for the purpose. Our engineering judgment has been criticized, and the company called upon for further suggestions. After spending considerable time in reaching the plant, the first glance at the equipment indicated what the trouble was. Dirt, dead insects, and accumulations of all sorts were on the lamps and inside of the reflectors. Merely the use of a little soap and water for cleaning the equipment has brought the installation back to a condition entirely satisfactory to the customer.

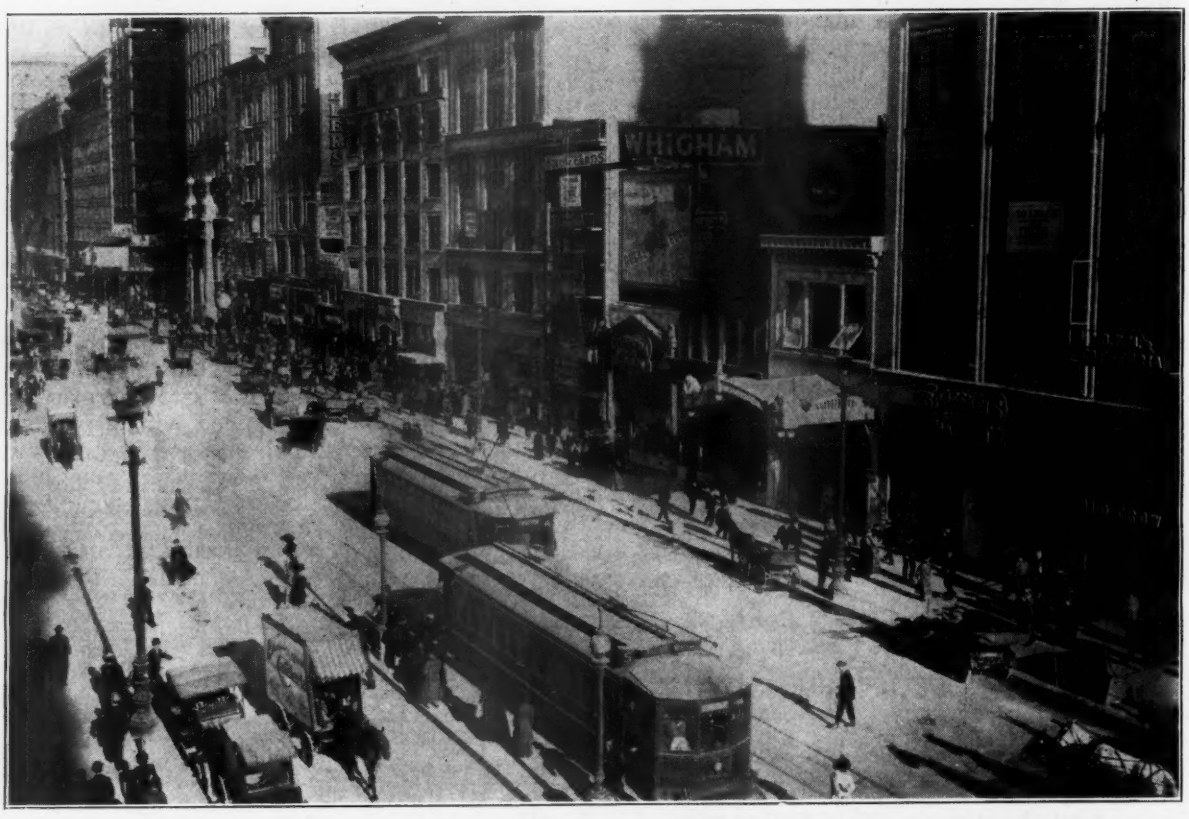
Lighting equipment requires the same attention as any electrical or mechanical apparatus. No plant engineer would tolerate dull tools, dirty boilers, or improperly oiled generators. Why, then, should lighting equipment be allowed to become inefficient through lack of maintenance? The answer in nine out of ten cases is carelessness.

In almost any office building, instances can be noted where semi-indirect units have been allowed to go uncleaned for six months or more. Examination of the figures in the accompanying table shows that approximately 40% of the light is being absorbed by the dirt under such conditions. A great deal of this depreciation occurs in the first few weeks, so for a period of several months the desks have been receiving only about 60% of the light which was intended to reach them and which could have been obtained at practically no extra cost if a little attention had been paid to cleanliness.

A typical case is on record where unsatisfactory lighting was reported in an office with indirect lighting. After preliminary measurement of the illumination the reflectors were cleaned, new lamps of proper voltage substituted for the overvoltage lamps, which were blackened from long use, the ceiling was repainted and a slight correction made in position of fixture parts. The subsequent test showed 185% increase over (or 285% of) the illumination before cleaning.

The importance of such an increase figured only in lighting cost is considerable, but considering the value of lost production probably many times the total cost of lighting, it should impress on any light user the vital need of proper maintenance.

San Francisco Folds Back Electric Signs in Daytime



San Francisco has one of the most unusual ordinances in the country and, as far as known, is the only city having such an ordinance. Under the San Francisco law electric signs are not allowed to extend over the sidewalks during the daytime. As a result, all signs are on hinges and are folded back against the front of the buildings during the day, as can be seen in the cut shown above. At night the signs are swung out over the sidewalks and illuminated. Some of the signs are operated by an elaborate system of ropes, similar to those used in raising and lowering awnings. In case of a fire occurring during the night in a building with electric signs in front, the signs are swung back against the building out of the way of the firemen.

In the center foreground of the cut is shown another San Francisco novelty, one not yet adopted by many cities. That is the raised loading platform for street-car passengers with electric lights on either end of the platform. The lights not only are an aid to passengers in boarding the cars but also warn vehicular traffic of the obstruction caused by the raised platform.

Low-Tension Conductors for Electric Furnaces

Determing Proper Cross-Section of Conductors to Minimize Skin Effect — Interlacing Low-Tension Leads to Reduce Inductance—Influence of Design and Operation on Power-Factor

In installations where heavy alternating currents are involved the difficulties of conducting the current from the transformer to the furnace terminals are very pronounced and unusual care must be taken in arranging the low-tension busses. Essential requirements are that sufficient cross-section be provided to conduct the extremely heavy current without excessive heating and energy loss, and that the conductors be so arranged that the inductance of the circuit will be a minimum.

A factor of decided importance in determining the proper cross-section of conductor is "skin effect" or the tendency of alternating current to seek the section of the conductor nearest the surface. When currents of from 10,000 to 50,000 amperes are used, conductors large in cross-section are required. Viewed from the consideration of resistance alone the problem is quite simple, but in the case of alternating current, unlike direct current, the simple resistance of the conductor is not a measure of its suitability. Alternating current does not take full advantage of the conductivity of an ordinary conductor; it does not distribute itself uniformly throughout the cross-section, but favors the area near the surface and shuns that near the center of the conductor. This is due to the fact that it encounters less inductance and impedance near the outer surface than it does near the center. For example, a portion of the center of the section of a cylindrical conductor might be removed without appreciably reducing its effective conductivity for alternating current, and it is for this reason that large cables are often built up around a non-conducting core. This effect is more pronounced as the frequency increases, so that it is of greater importance with 50 and 60-cycle installations than where the frequency is 25 cycles or lower.

With cylindrical copper conductors of ½-in. or even 1-in. in diameter, the "skin effect" at 25 cycles is negligible, but with a 2-in. conductor it has reached such a value that the effective resistance has increased approximately 25% over the corresponding resistance to direct current. With 60 cycles, the ½-in. cylindrical conductor offers a small increase in resistance to the passage of alternating current. From data compiled by the Westinghouse Electric & Manufacturing Co. it has been found that the 1-in. conductor has a 11% increase and the 2-in. conductor has approximately a 75% increase over the resistance to direct current. From these figures it will be seen that a solid cylindrical conductor with a diameter slightly over 2 ins. offers practically twice the resistance to a 60-cycle current that it does to direct current. Different conducting materials have different "skin effect" factors and while the above values are given for copper, the factor for aluminum conductors of the same cross-section is slightly less. For copper and aluminum sections of equal resistance the increase in resistance to alternating current is practically the same. These values are true regardless of the current density that is used. Fortunately, however, the conductance of heavy conductors can be improved even for fairly high frequency currents without resorting to the excessive increase in cross section mentioned above.

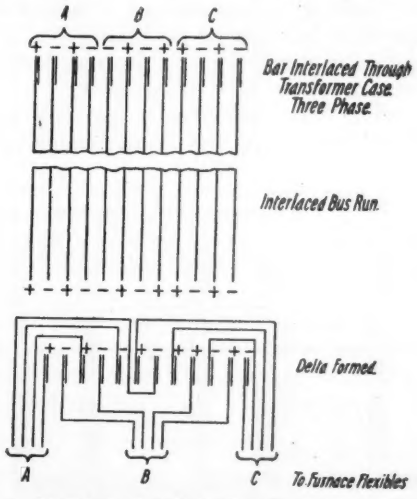


Fig. 1.—Method of Interlacing Busbars to Reduce Inductance of the Circuit.

In addition to the sectional area of the individual conductor, the shape must also be considered when heavy alternating currents are to be transmitted. For a given cross-sectional area of conductor, as far as effective resistance is concerned, the poorest solid-section form is round and the best, where the return circuit is near, is a thin flat sheet. If a solid cylindrical conductor be rolled into a sheet and then formed into a thin walled tube of the same cross-sectional area, the effective resistance of the tube will be considerably less than that of the solid cylinder. By separating a solid conductor into sections, with ventilating spaces between them, the current distribution of effective resistance is not affected, but the current-carrying capacity is increased, due to the greater radiating surface afforded and resulting lower temperature rise.

With the shape of the conductors determined so that they will be used to the best advantage without excessive heating, the next problem to be solved is to secure the proper relative position of the positive conductors with respect to the negative conductors so that the inductance of the

circuit will be kept at a minimum. Current distribution within a conductor is also affected by an adjacent conductor of opposite polarity, as the current tends to take the surface near to it. This is because on the near surface the mutual inductance is at a maximum and it, therefore, has a greater effect in reducing the self inductance. In this way the net inductance of the near surface is less than for an equal area on the far surface.

Interlacing Low-Tension Leads of Furnace.

Furnace transformer low-tension leads are generally interlaced alternately positive and negative when brought through the transformer case as shown in Fig. 1 for a three-phase shell-type transformer. In this way the inductance of the leads is kept a minimum because of the subtractive effect of the mutual inductance of adjacent bars of opposite polarity. Because of this the resulting inductance of a negative bar, with a positive bar placed on both sides of it, is considerably reduced by the mutual inductance subtracting from its self inductance.

The above condition also holds true for the bars after they leave the transformer so that

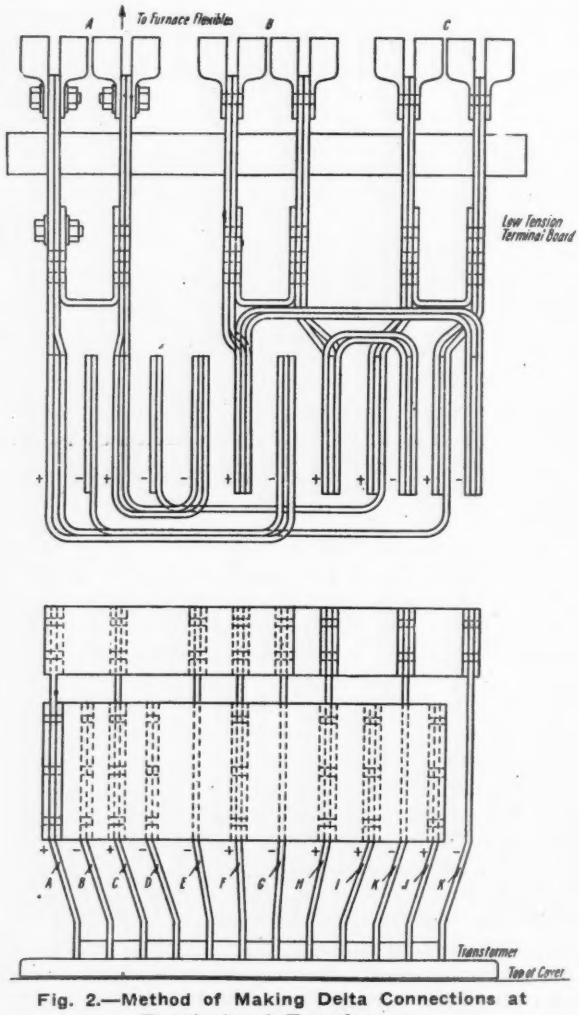


Fig. 2.—Method of Making Delta Connections at Terminals of Transformers.

they should be kept interlaced to a point as near the furnace as is possible. In this way the inductance of the circuit will be considerably reduced. An example of this is shown in Fig. 1, where the furnace bars are interlaced in the same manner as the transformer leads continued in this arrangement to a point near the furnace, where it is necessary to separate the leads and form the delta connection for the flexible cables. By this method the inductance of the interlaced section will be very small as compared with that of the section where the leads are separated for the flexible cable running to the furnace mast.

In an installation where the transformer can

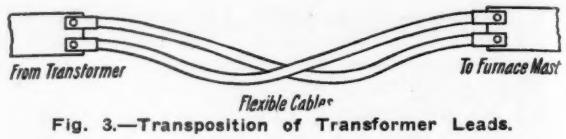


Fig. 3.—Transposition of Transformer Leads.

be placed very near the furnace, the delta connection can be made at the transformer terminals on top of the tank (Fig. 2) and in this case the flexible cables will run from here directly to the furnace mast. With this method the total distance from the transformer to the electrodes must be kept low as the inductance of the circuit increases rapidly where the phase leads are separated and not interlaced.

These same methods apply equally well for a star-connected secondary, the star connections being made either at the end of the interlaced run or on top of the transformer case.

Because of the usually short length of a low-tension run, transposition of the bus bars is not necessary. However, it would be desirable if possible, for with three separated phase groups of bars in one run the two outer groups will have a greater inductance than the center group. Where transposition is advisable and feasible and is within each phase group of the flexible cable, so that each cable will have an equal impedance and there will be no excessive heating in some of the cables. Fig. 3 shows a simple case with two cables transposed.

With transposition the aim is to have each cable of the group kept in same average relative position over the run and if this condition is secured then each cable will take an equal amount of current.

From the consideration so far it would seem that in addition to considering the simple ohmic resistance which the direct current encounters in a circuit, it is necessary in alternating-current work to contemplate the shape and size of the individual conductor and also the form and dimensions of the heavy-current circuit. When these quantities are known, some means are available for lessening the burden of conductor losses which the alternating current experiences, so as more nearly to make direct current conditions apply.

In order to consider some of the limitations encountered in practice an installation will be discussed.

Considerations Involved in a Specific Furnace Installation.

In an assumed furnace installation operating at 100 volts, 25 cycles, the conductor arrangement and service are such that a power-factor of 90% is obtained at rated full-load current.

By referring to the right-angle triangle in which 100 volts, the hypothenuse, represents the applied voltage, and 90 volts, the base, represents

the component of voltage in phase with the current, the resultant reactance component is found to be 43 volts. With this same furnace operating on 60 cycles for the same current value, the reactance component will be proportional to the frequency, or equal to 103 volts, which value is more than the impressed voltage. This means

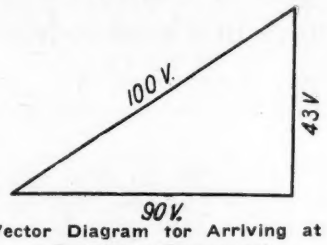


Fig. 4.—Vector Diagram for Arriving at Resultant Reactance Component.

that the furnace, even with the electrodes short-circuited, would not quite take full-load current from a 60-cycle supply circuit. On 25 cycles, with the electrodes short-circuited, the maximum current that will flow is somewhat less than 2½ times full-load current.

With a furnace circuit of constant reactance and varying resistance the maximum power input occurs when the reactance drop is equal to the resistance drop, or when the power-factor is 71%. With the furnace assumed above, this condition would be reached by moving the electrodes and decreasing the resistance until the current reaches 165% of full-load current. Under this condition with the power-factor 71%, the energy input is 130% of the full-load condition assumed above. This is then the maximum amount of power that can be put into the furnace when operating at 100 volts. Further reduction of the resistance and increase of the current would result in such a low power-factor that the energy input would decrease below that secured at 71% power-factor.

However, where a power-factor of 71% is obtained from a furnace load, it means that the capacity of the electrical equipment must be 141% of that required for supplying the true power component of the load. From the standpoint of the central station, this will not be as satisfactory a load as one with a power-factor around 90%, nor does the furnace operator care to purchase equipment 41% in excess of his needs and of useless reactive capacity. On the other hand, the arc furnace requires a certain amount of reactance in its circuit which serves to store energy momentarily and return it to the circuit during the period of the cycle when the alternating current passes through zero value. In general, approximately 30% reactance, corresponding to 95% power-factor, must be inherent to the electric arc furnace circuit in order to stabilize its operation. From an electrical standpoint, therefore, the arc furnace should always operate between approximately the limits of 71% and 95% power-factor and commercial furnaces of all types usually do operate within this range.

The capacity of electrical equipment is influenced by power-factor and alternating-current machinery is rated according to the product of the volts and amperes (kilovolt-amperes), which takes into account the limiting values of capacity as imposed by the current and its attendant heating effect. This is true not only of the generating machinery but also of the transformers. The heating effect of the current is proportional to the square of its value, so that as power-factor decreases, losses due to current flowing through the conductors will increase rapidly. Evidently it is an advantage to the furnace operator to secure a transformer of minimum kv-a. rating which will perform the service. The lower the reactance of the circuit, the higher will be the power-factor, the lower will be the first cost of the transformer and the conductor losses. Because of these factors too much care cannot be taken in planning a heavy-current bus layout in order to secure low reactance and a high power-factor.

The efficiency of a heavy-current conductor system is, in importance, on a par with that of the efficiency of the transformer and line from which the power is obtained. Accordingly, the question of loss in the heavy-conductor system must be viewed in the same way as the loss in the other parts of the system. The importance of these factors will determine the expenditures necessary to reduce the losses.

The weight of conductors for heavy currents is an important factor and ample provisions must be made for their support. Besides having mechanical strength, these supports must be insulators, although the potentials involved will not usually be in excess of 100 volts. The necessity for laminating and interlacing the conductors in heavy-current work complicates the support problem. The contacts and connections between different parts of the circuit and the terminals of the apparatus carrying the heavy current must also be laid out with the greatest care.

MANUFACTURE OF INCANDESCENT LAMPS EXPLAINED.

On Jan. 21, before the Lynn (Mass.) Section of the American Institute of Electrical Engineers, E. D. Stryker, of the engineering department of the National Lamp Works, Cleveland, Ohio, gave a talk on "The Manufacture of the Incandescent Lamp," illustrated by moving pictures and lantern slides.

The speaker summarized the history of the art for the past 35 years and showed that an incandescent lamp is essentially a filament of some material suitable to withstanding high temperatures and yet not vaporizing rapidly. By virtue of the filament being heated to incandescence by an electric current it gives light. To prevent burning up it is operated either in a vacuum or in an atmosphere of inert gas, or some gas which does not contain oxygen or any other element that will enter into chemical union with the filament. In a vacuum it suffers by reason of the absence of a pressure to hold it together and to resist a tendency for it to fly apart or vaporize. This difficulty can be overcome by the use of a gas in the bulb, thus making it possible to operate at high temperature without much vaporization, but there are heat losses through the path provided by this gas. In the case of small lamps the wattage thus lost would make gas-filled lamps actually less efficient than vacuum lamps, but as far as larger sized lamps are concerned there is a considerable gain in efficiency.

Use of Synchronous Motors in Cement Plants

Value of Synchronous Motors in Correction of Power-Factor —Discussion of Advantages of Such Motors in Cement Mills

By WILL BROWN
Electric Machinery Co.

Cement manufacturing takes quantities of power. Only one industry is a greater user of power in proportion to value of output—namely, ice manufacturing. Nearly 5 hp. of installed prime movers are required to each $1000 of annual product.

Raw materials of cement underlie vast areas of the earth's surface and, practically speaking, there are no patents or processes known to one manufacturer which are not known to all. Therefore, every cement mill must meet the competition of those who manufacture at lowest cost.

Long ago it was demonstrated that cement making was a specialized art. A mill had to be of fairly good size in order to compete at all—nor can any mill afford to delay in adopting mechanical improvements. Those mills that did not keep pace in the past are no longer in business. Roughly speaking, it takes about 1 hp. of prime movers for each barrel of cement produced per 24 hrs.

Electric power is the only power today in the cement industry. The reasons for it are so obvious that no one longer raises the question of any other drive.

But there is something about electric power which superintendents generally overlook. They figure that if they get motors big and rugged enough to start the loads—run at good efficiency and stand reasonable overloads—that is all that is necessary. Squirrel-cage induction motors have become almost universal. Slip-ring motors are used where the starting loads are particularly heavy.

Lagging power-factor is the result of all these induction motors. Eight out of ten cement plants are suffering constant losses from this cause.

Low power-factor is a real and insidious enemy in any mill—eating into the profits every hour.

The effect it has on electrical circuits is much the same as dumping a lot of dirt and waste matter into the machinery. The crushers, tube mills, etc., would be carrying all the time a large percentage of this useless material. The daily output of the mill would be cut down—the machinery would be overworked—and costs would increase. Wattless current is clogging the generators, the feeders, the transformers, and all the rest of the electrical apparatus in just this way.

It used to be considered necessary to put up with this condition. Nothing much was said about low power-factor because very few understood it. Apparently nothing could be done to prevent it. This is no longer so.

The synchronous motor can carry a load and correct power-factor at the same time. Cement plants have scarcely considered this type of motor at all but they are going to get acquainted with it rapidly. A motor which will permit a reduction of kilowatt-hours per barrel of cement is worth looking into. A motor which will earn a lower power rate for your mill—if you buy your power—or that will cut the costs of your own generating station and distribution circuit is a motor you ought to know more about. To give you some idea of the possibilities of this motor, compare what it has done in the ice industry.

Three years ago it was a very rare thing to find a synchronous motor in an ice plant. The Electric Machinery Co. made some of the earliest installations of high-torque synchronous motors in New York and Chicago. Today they are practically the only type used for ice machines of larger size in the modern plants. They have in many cases reduced the kilowatt-hours per ton of ice as much as 30%. Tests made in the city of Chicago have demonstrated beyond question the wonderful advantage of synchronous motor drive.

Let us take a quick birdseye view of motor conditions in the cement industry. Unlike most industries there are very few small motors used—the average size of all cement mill motors is over 48 hp. This is much larger than the average found in any other industry. For example: the average size of motor in the iron and steel industry is less than 27 hp. These figures are taken from the 1914 United States government census of manufactures.

Tube Mills.

Take tube mills for example. I have seen a battery of 22 of these in a single plant, all driven by a 200-hp., squirrel-cage motor direct-connected to the pinion shafts. The current was 25-cycle and the synchronous speed of the motors was 167. These big mills are started without difficulty by squirrel-cage motors.

Synchronous motors can develop higher starting torque than squirrel-cage motors and would handle such a starting load very easily. The standard frequency of 60 cycles does not permit of such slow speeds of induction motor as that quoted above. It is generally necessary to use a second gear reduction with the 60-cycle induction motor. But the synchronous motor on a 60-cycle system can operate at speeds as low as 150 or lower with entire satisfaction.

A single gear reduction on the big tube mills is all that is required. Tube mill motors are usually placed in a comparatively clean motor

room and it would be very simple to furnish excitation to the collector rings of each motor from common direct-current busbars.

The air gap of a synchronous motor is considerably larger than that of the induction motor and this means a much more rugged motor of slow speeds. Where rotor diameter is large, any slight bearing trouble in an induction motor quickly becomes disastrous because enormous magnetic strains are set up on one side of the rotor. This soon wears the bearings down still further and the rotor will commence scraping the stator.

Mill superintendents have all had this experience and know what it means to repair such a motor. I have seen many induction motors in the repair shops of cement mills which have shown evidence of this trouble. Some were so bad that the rotor laminations were mushroomed out of shape and the stator coils burned out. In all our experience nothing like this has ever happened to a synchronous motor.

By no means do I wish to carry the idea that synchronous motors can be applied to all loads. The induction motor will still be used in the great majority of cases—three motors out of four will be of the induction type. But if enough big synchronous motors are used the balance of the motors will operate much more satisfactorily.

There is now on the market a new design of induction motor. These are specially adapted for cement mill drive, as they are totally inclosed and ventilated by forced fresh air piped to the motor intake. These motors are all equipped with absolutely dust-tight ball bearings which require attention no oftener than once in 6 months.

Shafts and bearings are so large (being much bigger in proportion than the ordinary general purpose motor) that they can stand the roughest shocks and strains. Very rarely would it be necessary to supply an outboard bearing. Not a bolt nor screw nor rivet is used in the end rings nor are there any welded connections with possibility of crystallization.

Since there is no dust allowed to collect on the coils or cores, with consequent heating, this type of motor is designed for higher magnetic densities in the iron. This means that the proportion of active material is higher and the motors operate at higher power-factor and generally higher efficiency than most mill-type motors. The distinctive shape of rotor bars (in deep rectangular slots) gives very high starting torque.

These motors can be used outdoors and require no housing or protection whatever. One of the largest cement companies in Pennsylvania is installing a group of these motors ranging in size from 40 to 300 hp. Some of these are to operate in exposed outside places driving pumps, etc.

The Synchronous Motor at Slow Speeds.

The principal reason cement plants have such a fondness for 25-cycle current is owing to the fact that they can thus obtain much slower speeds. A 25-cycle motor of 150 r.p.m. has the same number of poles as a 60-cycle motor of 360 r.p.m. Electrical authorities are pretty well agreed that the 25-cycle frequency must go.

Eventually all standardized alternating current in the United States will be 60 cycle. The cement industry cannot afford to be behind the procession—it must follow the trend of the times and 60-cycle installations will increase at the expense of the lower frequency.

For slow motor speeds at 60 cycles, synchronous motors are particularly well adapted. The only serious limitation to the use of synchronous motors in cement mills will be found in connection with the d-c. exciters. The air is thick with stone and cement dust but there is nothing inherently harmful in the action of cement dust on the commutators of d-c. machines. In fact, some cement plants use nothing else but d-c. motors. A single exciter unit can be placed to feed current to common busbars for a group of synchronous motors. A motor-generator set in a clean place will give satisfactory service with very little attention.

Power-factors of 60% or lower are by no means uncommon among cement plants. The probabilities are that if the tube mills were all equipped with synchronous motors—designed to operate at a leading power-factor under full load—the power-factor of the whole plant would be raised to a very satisfactory point, say 90% or higher.

Even if all other machines were driven by induction motors, the tube mill motors would correct the power-factor for the whole plant and bring about large savings in the overhead cost of electric current.

CONDITIONS WHICH DETERMINE MOTOR POSSIBILITIES IN CEMENT MILLS.

CONDITIONS EXISTING IN PLANTS.	CONDITIONS IMPOSED ON MOTORS.	RESULTS.	ALTERNATIVES.
(1) Dust-laden air.	Clogged air ducts.	Limits ventilation of induction motors, increases heating, cuts down capacity, extra strain on insulation.	Either oversize motors which give low power - factor— or— Enclosed motors with forced ventilation, which give reasonably good power-factor and high efficiency.
	Grit in the bearings.	Bearing troubles.	Totally enclosed sliding bearings— or— Preferably, ball bearings.
(2) Unskilled labor.	Requires simple apparatus.	The squirrel - cage motor most nearly fool-proof.	Results obtained by high power-factor will justify added cost of attendance for synchronous motors.
(3) Heavy starting duty.	Puts extra strains on end rings, etc.	Requires extra rugged motor.	The synchronous motor can start reasonably heavy loads, such as tube mills.
(4) Continuous plant operation.	Demands that processes must not be interfered with by breakdown of any single unit.	This means individual drive.	If synchronous motors are used, exciter troubles must not interfere with motor operation. Provision for group excitation must include extra exciter units for emergencies.

ELECTRICALLY HEATED PATTERN PLATES ON MOLDING MACHINES.

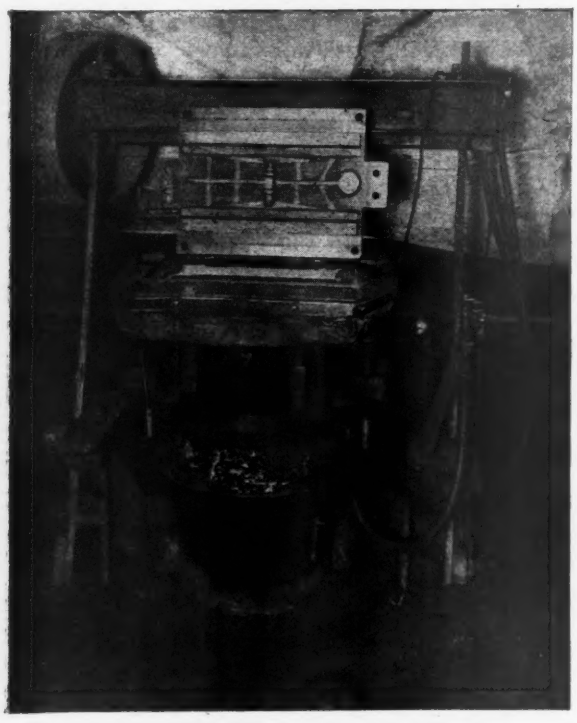
By JOHN M. STRAIT,

Industrial Heating Section, Supply Department, Westinghouse Electric & Manufacturing Co.

The production of clean, smooth castings from molds made with metal patterns depends upon there being no sticking of molding sand to the patterns when they are removed from the sand. There is a tendency for moisture to collect on the cold metal pattern from the moist sand, or for the cold plate to "sweat," during which process moisture collects on it. When this moisture collects, the sand sticks to the pattern being removed from the mold, and the mold acquires a rough surface, so that when the metal is poured the casting will have a rough surface. This pattern will now have a rough surface due to the adhering sand, so that when the next mold is made it will have a rough surface unless the pattern is cleaned off and dried. This trouble is experienced both in summer and winter.

This collection of moisture can be prevented by heating the pattern. The heat applied, however, must not be so great as to cause the sand in the mold to dry, as it would then crumble away and the casting would again have a rough surface. Furthermore, the heat must be applied in such a way that the pattern can be conveniently changed when desired.

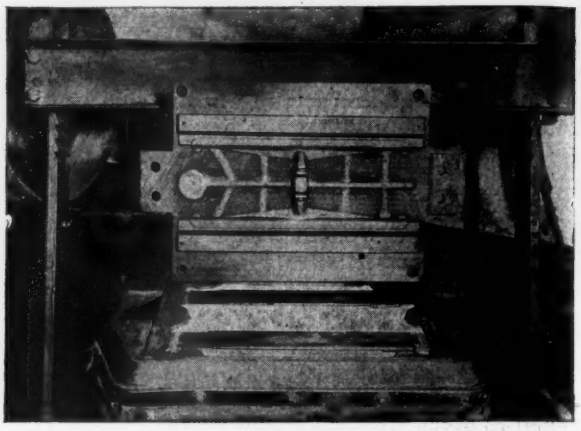
The usual method of heating is by means of a gas flame left burning in the space underneath



General View of Molding Machine, Showing Location of Heaters.

the pattern within the framework of the molding machine. It is difficult to keep the flame low enough so that it will not heat the pattern too much. A larger flame than necessary is, therefore, employed at some distance from the surface of application. This makes an inefficient arrangement, as most of the heat is dissipated into the surrounding space. The surrounding air becomes contaminated by the gas fumes, and in summer there is the further discomfort due to the heating of the surrounding air.

Difficulty is experienced due to variation of gas



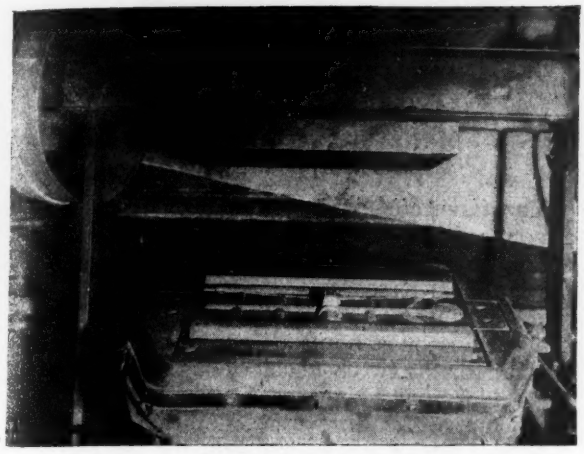
Closer View of the Metal-Clad Electric Heaters.

pressure, so that at one time the pattern is too hot and at another too cold. When the pattern gets too hot, it is necessary to cut off the gas, and when it has cooled down, relight and readjust it.

A much more convenient method of heating is by the use of electric heaters as shown in the accompanying illustrations. Two steel-clad heaters are shown mounted in the space immediately below the metal pattern plate, within the framework of the molding machine. In order to use as little heat as possible, they are located just below the thickest pattern used. They are attached to simple supporting angles attached to the frame of the machine. It is obvious, then, that any pattern of any thickness and of any size within the capacity of the machine may be attached to or removed from the molding machine without being interfered with by the heaters, and without disturbing the heaters whatever. To conserve heat, an asbestos insulating plate is placed just below the heaters so as to prevent loss of heat due to radiation downward from the heaters. The entire installation is made in such a way as not to interfere in any way with the usual operation of the machine, including the mechanical vibrator, and without any modification of the machine other than to drill and tap small holes for attaching the mounting angles.

As stated above, the heaters are of the steel-clad type. For the molding machine shown, taking a pattern plate 16 by 11 by 2 ins., there are two heaters each 13 ins. long by 2¼ ins. wide by ¼ in. thick over-all. They consist of slotted ribbon registers of high-resistance, temperature-resisting alloy insulated in mica troughs, the whole being incased in a heavy sheet-steel casing. There is a mounting lug on each end with holes punched in for mounting the heaters. The heater terminals are mounted on one end of the heater casing and are protected by a substantial terminal cover. The two heaters used on each machine have a total rating of only 300 watts, and operate on 110 volts. The heaters are permanently connected together electrically, and connection is made to a wall receptacle convenient to the machine by means of a flexible heater cord having a separable attachment plug on the end.

Because of the small space in a vertical direction occupied by the heaters, there is ample room for them in the somewhat restricted space available, and, due to the flexible heater cord, it is possible for the pattern support to be raised or



Pattern Being Warmed by the Heaters.

lowered, the heaters moving as an integral part of it.

The advantages of this heater over gas are obvious. When it is desired to heat the pattern plate it is not necessary to hunt for a match, operate valves, burn the fingers, or adjust valves until the correct degree of heat is obtained. Instead it is only necessary to plug into a wall receptacle and give no further thought to the matter, since but one degree of heat, and that the correct one, can be obtained. If for any reason, such as the machine standing idle, the pattern plate should be overheated, it is not necessary to operate any valves, such as shutting off the gas, until the temperature becomes right and then relight and readjust the valves. Instead, it is only necessary to pull the plug from the wall receptacle and leave the heater disconnected until the temperature becomes right, and then plug it in again. Furthermore, no trouble is experienced from variation of gas pressure, and a steady, uniform heat is obtained.

VARIATION OF LONG ELECTROMAGNETIC WAVES.

The observed direction of radio waves as obtained with a direction-finder varies with time. When long waves are used, such as those from very high power stations, the variations of direction are of the order of 90 deg. No such large variations are found for short damped waves produced by spark apparatus. Lieut.-Com. A. Hoyt Taylor, of the United States Naval Aircraft Radio Laboratory, Bureau of Standards, has worked out a method of increasing the sharpness of determination of direction and a theoretical explanation of the variations of direction based on the existence of media in the earth's atmosphere, capable of reflecting and refracting the waves.

Single copies, or more, of this paper which is designated as Scientific Paper No. 353, may be had for 5 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C.

REVIEW OF ACTIVITIES OF GOVERNMENT ENGINEERS DURING WAR.

Gigantic Work Carried on by the Construction Division of the Army—Much Work Remains to Be Done.

A resume of the expenditures necessary to place our army on a peace-time basis and at the same time utilize the material now held by the Government in the different temporary cantonments throughout the United States, was made by Harry B. Joyce, formerly a major in the Quartermaster Corps, before the recent convention of the Ice Manufacturers' Association at the Hotel Astor, New York City. Major Joyce, who is an electrical engineer, was discharged from the army a few months ago. As one of the heads of the Construction Division, Major Joyce was closely in touch with the expenditures of the Government for the maintenance of the army during the war, and he quoted many facts and figures never before made public.

The work of the Construction Division in magnitude, speed of accomplishment, number of workmen employed and materials involved, dwarfs any other engineering project the world has ever known," said Major Joyce. "At 547 sites, scattered from the Atlantic to the Pacific, 581 separate projects, employing over 400,000 men, were simultaneously under way. The Panama Canal, which required 10 years to construct, cost approximately $375,000,000, whereas the work of the Construction Division for one year and a half exceeded three times this amount. Other than loans to the nations associated with us and pay of the army, the war cost the Government $12,000,000,000, and our division had the responsibility for about 10% of the total cost of the war in a commercial way.

"As an example of the work done other than that of the camps and cantonments, there were constructed seven ammunition storage depots and nine plants for assembling ammunition. These include shell-loading plants for mixed ammunition, two cartridge factories, one plant for loading aerial bombs and one for manufacturing incendiary bullets; 20 chemical manufacturing plants, with their buildings, facilities and equipment for the manufacture of TNT and poisonous gases. The various factories and factory additions for the manufacture of Liberty motors, tank tractors, automatic pistols, etc., laboratories and experimental stations were among the various and diversified projects.

"The warehouse area of the terminals approximates 698 acres of storage space. These storehouses vary from one-story brick, tile or concrete buildings to nine-story concrete buildings. Adjacent to the terminals are piers and docks equivalent to 7½ miles of wharves for loading ships. The magnitude of the undertaking may be realized when I quote the following figures:

Number of employes	427,000
Number of buildings to shelter troops	54,000
Hospital capacity provided (beds)	185,000
Docks, lineal feet	39,000
Lighters	142
Derrick barges	61
Standard-gage railroads (miles)	987
Storage and depot warehouses (acres)	698
Remount capacity (animals)	217,000

"But having accomplished what it set out to do during the emergency, the Construction Division still has much work before it. Much new construction of a more permanent nature must be done before this new peace-time army can be housed. The present national defense act provides for a peace-time army of 11,876 officers and 221,045 enlisted men, of whom approximately 2520 are noncommissioned officers entitled to separate quarters. There are at the present time in the United States and its possessions permanent quarters for only 4389 officers, 1739 noncommissioned officers and 118,574 enlisted men. Assuming that 15% of the officers will be on detached duty and on a commutation basis and also that 75% of all of the existing quarters, regardless of their location, will be available for permanent housing, additional quarters must be provided for the following permanent personnel:

	War Department Bill.	Dent Bill.	National Defense Act.
Married officers	14,583	8,923	5,462
Bachelor officers	6,250	3,825	2,341
Married noncom. officers.	3,147	1,432	851
Bachelor noncom. officers.	1,349	614	365
Enlisted men	415,184	201,720	129,595
Total	440,513	216,514	138,614

"This is exclusive of the student army under universal military training. Two plans are feasible—one to remodel the temporary structures built during the war emergency so that they will house this personnel, and the other contemplates new and permanent buildings.

"In order to make the temporary buildings livable it will be necessary to paint and repair them, seal and line the walls of the barracks, add two-story porches, replace tar-paper roofing with permanent covering, put in new floors and foundation posts where necessary, and also provide walks and make improvements to the roads, surface drainage, and grounds. To convert a 66-man barracks, which originally cost $5000, into a two-family house, with necessary steam heat, etc., will cost approximately $9650. To convert a 150-man barracks, which originally cost $14,000, it will cost approximately $28,000. The saving effected by remodeling the existing buildings is only about 25%.

"In addition to the conversion of temporary barracks to permanent quarters, certain other buildings, such as laundries, warehouses, etc., must be made suitable for permanent use. The hospitals will be reduced in bed capacity to meet the requirements of peace-time personnel, and the space thus made available will be used to house officers and men. Nothing is included for the remodeling of hospital buildings except to provide permanent roofs.

"The cost of building new and permanent quarters for housing the army is about 3½ times that of converting existing buildings for this purpose. These two plans represent the maximum and minimum housing requirements for the army. While much of the space and material now in the hands of the Government can be used, it is probable that a modified plan contemplating the use of remodeled existing buildings for enlisted men and bachelor officers and new permanent quarters for the married personnel may be to the best interest of the Government.

"The necessary outlay for new quarters can be substantially offset by the sale of certain of the old army posts which are no longer needed by the War Department."

NATIONAL RESEARCH COUNCIL GIVEN $5,000,000 DONATION.

Council and National Academy of Science May Build Washington Home.

The Carnegie Corporation of New York has announced its purpose to give $5,000,000 for the use of the National Academy of Sciences and the National Research Council. It is understood that a portion of the money will be used to erect in Washington a home of suitable architectural dignity for the two beneficiary organizations. The remainder will be placed in the hands of the Academy, which enjoys a federal charter, to be used as a permanent endowment for the National Research Council. This impressive gift is a fitting supplement to Mr. Carnegie's great contributions to science and industry.

The Council is a democratic organization based upon some forty of the great scientific and engineering societies of the country, which elect delegates to its constituent divisions. It is not supported or controlled by the Government, differing in this respect from other similar organizations established since the beginning of the war in England, Italy, Japan, Canada and Australia. It intends, if possible, to achieve in a democracy and by democratic methods the great scientific results which the Germans achieved by autocratic methods in an autocracy while avoiding the obnoxious features of the autocratic regime.

The Council was organized in 1916 as a measure of national preparedness and its efforts during the war were mostly confined to assisting the Government in the solution of pressing wartime problems involving scientific investigation. Reorganized since the war on a peace-time footing, it is now attempting to stimulate and promote scientific research in agriculture, medicine and industry, and in every field of pure science. The war afforded a convincing demonstration of the dependence of modern nations upon scientific achievement and nothing is more certain than that the United States will ultimately fall behind in its competition with the other great peoples of the world unless there be persistent and energetic effort expended to foster scientific discovery.

PLANS $3,000,000 IMPROVEMENT.

United Illuminating Co., of New Haven and Bridgeport, Conn., which furnishes electric current for lighting and power purposes in these two cities, plans the erection of one of the largest power stations in New England. The plant will be erected in Bridgeport, and will have an ultimate capacity of 100,000 kw., of which 30,000 will be installed immediately. The new plant is located on the water front and with equipment will cost in the neighborhood of $3,000,000. Westcott and Mapes, Inc., 207 Orange street, New Haven, Conn., are the designing engineers on the project.

Editorial Comment

Maintenance of Lighting Systems

There is no humanly devised contrivance, apparatus or equipment but what requires more or less maintenance to keep it in operating and serviceable condition. The public recognizes this in a general way and yet is prone to forget the fact, even in the case of the automobile for which the common statement, "It isn't the first cost, but the upkeep," shows that maintenance is acknowledged to be vitally important. As a device becomes more and more easily maintained, the tendency is to neglect what maintenance actually is needful.

This truth is shown by the quite common neglect in maintaining lighting systems. When the arc lamp was in general use it was absolutely necessary to attend to trimming regularly. Now that these lamps have been generally replaced by incandescent, the lower frequency of the necessary upkeep results in too many cases of almost utter neglect. The point of the whole matter evidently is to impress the public that neglected maintenance means, first, inefficiency in the lighting and therefore waste, and second, failure to obtain the illumination originally secured and therefore disappointment if not outright dissatisfaction.

One of the most effective ways to interest the average layman in the need for regular lighting maintenance is to show him the monetary loss from its neglect. This is done very cleverly in an article by Mr. A. L. Powell dealing with this subject in this issue. Both numerical and graphical demonstrations of this point are clearly made, the results in the case cited showing that the most economical maintenance calls for cleaning at intervals of a trifle over three weeks. Under different conditions this economical period would be less or more than three weeks. It is better to err in favor of shorter periods than that which is strictly most economical on the basis considered by Mr. Powell, because the slightly higher cost of more frequent cleaning will result in better maintained average illumination and therefore better conditions for the eye or higher visual efficiency.

There is, of course, a considerable percentage of the public that cannot be so readily impressed by means of a graphic or numeric argument involving technical features. For such persons the effort should be made to make a simple appeal to their common sense. Everybody recognizes that cleaning windows is not only for the sake of cleanliness itself, but to permit daylight to enter freely into the room. Likewise, cleaning of lamps is equally necessary to permit their light to enter the room without being obstructed by dust and dirt on the lamp's luminous surfaces. This simple argument is quite readily grasped by even an uneducated person.

While frequent and regular cleaning of lamps and reflectors is nowadays the most important feature of lighting maintenance, another important feature is to see that the proper lamp and reflector is maintained at each outlet. This involves prompt replacement of each burned-out or broken lamp by a new lamp of proper type, size and voltage, and also similar renewal of broken or damaged reflector, shade or other accessory equipment.

To correct this latter phase of maintenance is more difficult in many cases than to secure regular cleaning. But it is usually found in premises where almost every employe is permitted to change or tamper with the lamps and equipment. General use of locking sockets is at least part of the solution where localized lighting is still employed. Where general lighting is used the problem is already largely solved by the relative inaccessibility of the lamps to the occupants. A rigid rule that all lighting maintenance must be taken care of only by the electrician or other authorized employe, who will be held responsible therefor, should complete the solution.

It must be impressed on all users of lighting systems that, if the system is initially well designed and installed, it must be kept up to its initial standard as nearly as is inherently possible if the original results are to be obtained indefinitely. Failure of any of the essential features of maintenance can mean only dissatisfaction, which is likely to be blamed on the lighting system instead of the lack of system in the upkeep.

In the case of large commercial or industrial establishments, office buildings, institutions, and the like, a satisfactory maintenance organization can readily be established, either as a separate department or through the co-operation of the crews serving under the chief electrician and chief janitor. In the case of small or medium-sized establishments good results have recently been obtained through contract maintenance service furnished by trained organizations specializing in such work. In some cases private

companies have been organized for this purpose to good advantage for all concerned. More commonly such maintenance service is furnished by the lighting company whose object is to give the maximum of satisfaction in the way of lighting service. The value of systematic maintenance service cannot be emphasized too strongly under all circumstances. To secure greater recognition of its importance it would be well for all concerned with the lighting business—manufacturers of lamps and equipment, jobbers and local distributers, contractors and central stations—to keep the matter before their customers so that the maximum of lighting service may be rendered.

Lighting of Power Plants and Substations

In the old days, central stations were accustomed to using up the old carbon lamps rejected by their customers in their stations. Their efficiency was low and their illumination deficient. But they sufficed for lighting company property, perhaps, since income was not at stake, and the creed of correct lighting and the influence of lighting upon safety had not been discovered.

Today conditions have changed. The gospel of good lighting is here. The safety movement has gained a strong hold in industry, on the street and in the household. And the carbon lamp, half worn-out, is not available for lighting central-station properties; nor would it be used if it were, because of its low efficiency if for no other reason. But the illumination of central-station properties, power stations and substations especially, in the majority of instances still leaves much to be desired. As often as not there is a deficiency of light. In many other cases there is, as Milton says, "Dark with excessive light," because the light is not where it is wanted and by its presence throws into the shade what it is desired to see.

The design of power plant lighting systems—the lighting circuits and location of lamp outlets—cannot be laid out as can those of an office or theater or factory. What is needed more is sufficient general illumination to permit efficient and safe mobility of persons and materials around the plant, and more intense and concentrated illumination locally. That this condition may obtain requires, of course, not only that the location of apparatus be known but also its contour. Under ordinary circumstances, therefore, it is probably best that the general lighting circuits be installed as the station progresses, the local lighting being installed later, when the requirements to be met are known. In any case, it is in the best interests of economical lighting, as well as effective illumination, that there be two distinct lighting systems, one for general lighting and the other for specialized lighting, since the latter is not needed so long nor so often as the former.

A cursory inspection of many stations shows that those that laid out the lighting systems were not familiar with plant operation. Lamp sockets are located so that the objects they are intended to illuminate are thrown into darkness of shade or that the light dazzles the eye instead of throwing the object into relief. This condition is particularly noticeable around boiler rooms where instruments, water columns, etc., are supposed to be easily visible, and around oil-switch and disconnect-switch cells.

Economy of lighting, efficiency and effectiveness of application, and flexibility of availability seem to be the prime requisites for power-plant illumination. Economy means that needless lights shall not be required and that illumination for specific purposes can be obtained from lamps installed for that specific purpose. Lighting effectiveness means that lamp sockets are located so as to be most effective, a condition that meets the requirement of economy also. Flexibility means that lamps judiciously located may be turned on and off individually as conditions dictate, instead of indiscriminately because switches are lacking.

More attention to power plant and substation lighting is badly needed. And, as we stated before, the matter should be considered from the aspects of safety, effectiveness and economy. In many cases it is a matter of more light. In other instances it is not so much a matter of more light as one of light better placed and better arranged for conditions as they exist. The central stations are diligently preaching the gospel of good lighting. In their earnestness they must not forget to practice what they preach.

Publicity for the N. E. L. A. Convention

President R. H. Ballard of the National Electric Light Association and his fellow officers are putting forth exceptional efforts to make the coming national convention at Pasadena, Cal., next May the most successful in the history of the organization. Realizing that the trip to the Pacific coast involves considerable time and expense, the convention committee has devoted extra time to plans that will call the central-station men to California despite its distance from the center of the electrical industry. President Ballard's recent tour around the country, now nearly completed, has served to arouse great interest in the convention and gives assurance of an attendance close to 4000, according to a recent estimate made by him.

Current Events

A. I. E. E. to Convene—Jobbers Meet—Protest Against Coal Prices — Alexanderson Receives Medal — Code Changes

PROGRAM FOR MIDWINTER CONVENTION OF A. I. E. E.

Power Production, Electrical Communication and Measurements Chief Topics for Discussion.

The eighth annual midwinter convention of the American Institute of Electrical Engineers will be held Feb. 18-20 in the Engineering Societies Building, New York City. Six technical sessions will be held, beginning Wednesday evening. On Thursday morning a symposium will be presented on economical supply of electric power. On Thursday afternoon two parallel sessions will be held, of which one will be devoted to electrical communication. On Friday the morning and afternoon sessions will be both under the auspices of the Instruments and Measurements Committee.

The detailed program is as follows:

Wednesday, 8:15 *p. m.*

Address by President Calvert Townley.

"Daylight Saving," by Preston S. Millar.

"Essential Statistics for the General Comparison of Steam Power-Plant Performance," by W. S. Gorsuch.

"Standard Graphic Symbols," by E. J. Cheney.

Thursday, 10:30 *a. m.*

"Economical Supply of Electric Power for the Industries and the Railroads of the Northeast Atlantic Seaboard," a symposium.

Thursday, 2:30 p. m.—Communication Session.

"Printing Telegraph Systems," by J. H. Bell.

"Maximum Output Networks for Telephone Substation and Repeater Circuits," by G. A. Campbell and Ronald M. Foster.

Thursday, 2:30 p. m.—Measurements Session.

"A Method of Separating No-Load Losses in Electrical Machinery," by C. J. Fechheimer.

"Inherent Regulation of D-C. Circuits," by A. L. Ellis and B. W. St. Clair.

"Measurements of Projectile Velocities," by P. E. Klopsteg and A. L. Loomis.

Friday, 10:30 *a. m.*

"A New Form of Vibration Galvanometer," by P. G. Agnew.

"Precision Galvanometer for Measuring Thermo E.M.F.'s," T. R. Harrison and P. D. Foote.

"Notes on Synchronous Commutators," by J. B. Whitehead and T. Isshiki.

Friday, 2:30 *p. m.*

"Oscillographs and Their Tests," by A. E. Kennelly, R. N. Hunter and A. A. Prior.

"The Accuracy of Commercial Measurements," by H. B. Brooks.

A dinner-dance will be held at the Hotel Astor on Thursday evening at 7 o'clock to provide a social function for the entertainment of the members and their guests in attendance at the convention.

Inspection trips will be arranged for Wednesday afternoon especially and at other times during the convention to some ten power houses, electrical laboratories and other places of electrical interest in and near New York City. Further details can be secured from Secretary F. L. Hutchinson, 33 West 39th street, New York.

ELECTRICAL JOBBERS HOLD DIVISION MEETINGS.

Atlantic and Central Divisions of Electrical Supply Jobbers' Association Met to Discuss Trade Conditions and Problems.

The Atlantic Division of the Electrical Jobbers' Supply Association met in New York City, Feb. 9, to discuss matters of interest to the members and to make arrangements for attending the annual meeting at Del Monte, Cal., in May. A large number of members and guests were present from the eastern states, and although only one day was allotted, a large amount of business was transacted. The importance of the meeting was indicated by the large number of speakers who took part in the program, which was entirely informal.

The meeting was opened by an informal address by George W. Provot, who was asked to speak about the conditions of the steel industry at present. In order that the situation may be described accurately, he said one must consider the source of supply because the articles entering into the manufacture of steel products control their supply at present. As a general thing, it may be said that the demand for steel is far beyond the capacity of the mills.

The two principal subjects under discussion related to the turnover on lamps that is being asked by manufacturers and the discount allowed on electric heating devices. At present these articles are handled by the jobbers at a definite loss. There are several reasons for this situation which were brought out in the discussions. Some of these reasons are that the cost of doing business has increased during the last few years, that central stations and "A" agents can get supplies directly from the manufacturers, and that these commodities are sold in small quantities. Figures were presented that showed that the value of the average order is only $24 and that 88% of the orders are for less than six articles

F. C. Price presented a detailed analysis of the costs and income of a jobber's business which showed that the gross profit is 20%. It showed,

also, that no net profit would accrue unless the gross profit was approximately 25%. It was the censensus of opinion of those who took part in the discussion that the jobbers are handling these commodities at a definite loss. It was shown also that to make more than four turnovers per year under present conditions is impossible. The report of the Lamp Committee, which has tabulated a large amount of data, stated that it will be impossible to make these turnovers, it will be difficult to make five, and that it is fair to expect four. It was brought out, moreover, that 90% of the lamps handled by the "A" agents are distributed by the "B" agents. Several resolutions were passed which stated the attitude of the members toward the present method of handling lamps and heating appliances.

W. L. Goodwin called the attention of those present to the importance of the meeting to be held in California in May. Every jobber ought to go. Matters will be brought up that will definitely reshape the electrical industry for a generation. In addition, those who attend the jobbers' meeting will be able to attend the N. E. L. A. convention that is to be held at Pasadena following the jobbers' meeting. Secretary Donald Tolles stated that two through cars have been reserved already for members who will attend the Pacific coast meeting via New York City.

In response to a request from Chairman W. I. Bickford, Mr. Goodwin gave a brief review of the aims of the reconstructed Conference Club.

Frank A. Merkel described the aims and purposes of a new publication, *The Jobbers' Salesman,* that he, Howard Ehrlich and C. W. Forbrich will launch soon. The proposed publication has created considerable interest among jobbers. Several features unusual in technical publications will be contained in the periodical and well-known contributors will supply communications of interest to the trade.

A. M. Little, Mohawk Electric Supply Co., Syracuse, N. Y., was elected chairman of the Atlantic Division.

A meeting of the Central Division of the Electrical Supply Jobbers' Association was held at the Hotel LaSalle, Chicago, Feb. 9, at which a number of papers and addresses were presented. V. G. Eastman, of Erner & Hopkins Electric Co., Columbus, Ohio, addressed the meeting on "Petty Warehouse Thievery;" Martin J. Wolf, of W. N. Mathews & Bro., St. Louis, Mo., spoke on "Picking the Right Man," referring to the proper selection of such employes as salesmen, purchasing agent, credit manager and others for positions of responsibility; B. B. Downs, of St. Paul (Minn.) Electric Co. presented a paper on "Farmhouse Lighting Outfits;" R. P. Oplinger, of Indianapolis (Ind.) Electric Supply Co., presented a paper on "Do Reductions in Prices Stimulate Business?" and Paul Tafel, of the Paul Tafel Electric Co., Louisville, Ky., spoke on "The Elimination of the Jobber from the Retail Business." The discussion on these subjects was general and brought out a broad interchange of ideas.

W. R. Herstein, of Memphis, Tenn., was elected chairman of the Central Division of the association.

N. E. L. A. OFFICERS PROTEST INCREASED COAL PRICES.

Operators Seek to Add the 14% Wage Increase to Coal Prices—Association Protests Vigorously Against This.

R. H. Ballard, president, and H. M. Aylesworth, executive manager of the National Electric Light Association, sent a letter on Feb. 5 to Chairman Henry M. Robinson of the Bituminous Coal Commission at Washington protesting against the increase in prices of coal to utilities that is being charged by the coal operators since the coal-strike settlement occurred. By the terms of the settlement, the operators agreed to increase wages 14%. It was the understanding of the utilities that this increase would be absorbed by the operators instead of being passed on to the public. As a matter of fact, where it can be done, even where certain contracts were in existence previous to Oct. 30, the 14% is being added to the price of coal.

The contracts existing previous to Oct. 30 to which the 14% increase is being added are those having clauses for automatic adjustment of prices when wages are readjusted. The position taken by the officers of N. E.L. A. is that, since the operators agreed to absorb the 14% increase in wages after these contracts were signed, the operators should not pass this increase along to the public by raising the price of coal contracted for before Oct. 30. Rates charged by the utilities, which are regulated by commissions, are based on the contract price of coal. Any increase must be absorbed by the utilities or passed on to the public. Any other position violates the spirit of the settlement of the coal strike.

The Attorney General has ruled that the operators can increase the prices as they have done. The N. E. L. A. is asking for a reconsideration of this ruling.

NEW MEXICO ELECTRICAL MEN TO HOLD ANNUAL SESSION.

Members of the New Mexico Electrical Association will meet in Albuquerque, N. M., Feb. 16, 17 and 18, for the sixth annual convention of the association. A long program has been prepared, including an address on Feb. 17 by R. H. Ballard, president of the National Electric Light Association, on "Relation of the N. E. L. A. to the Central Station." Other subjects taken up during the convention will be "Fire Losses by Electricity," by L. A. Barley, Rocky Mountain Fire Underwriters' Association, Denver; "The Coal Situation," by D. E. Bent, Tucuman Light & Power Co.; "Developments of the Electrical Industry," by B. C. J. Wheatlake, Mountain Electric Co., Denver, and "Outlook for Electrical Merchandising in 1920," by J. J. Cooper, Mountain Electric Co., Denver. There will also be papers on scientific subjects by S. E. Doane, chief engineer, National Lamp Works, Cleveland; W. C. Wurfel, Westinghouse Lamp Co., Los Angeles; J. F. Greenawalt, Mountain States Telephone & Telegraph Co., Denver; K. E. Van Kuran, Westinghouse Electric & Manufacturing Co., Denver, and Prof. R. W. Goddard, New Mexico College of Agriculture and Mechanical Art."

E. F. W. ALEXANDERSON RECIPIENT OF RADIO INSTITUTE MEDAL.

Institute of Radio Engineers Awards Medal for Distinguished Services — Recipient Made Chief Engineer of Radio Corporation of America.

Ernst F. W. Alexanderson, consulting engineer of the General Electric Co., has recently been doubly honored as a result of his remarkable achievements in the radio world. He has been elected chief engineer of the Radio Corporation of America, the new organization which plans to connect the nations of the world by wireless. He has also been elected vice-president of the Institute of Radio Engineers, an international organization, and awarded a handsome gold medal by the Institute in "recognition of distinguished service in radio communication in 1919."

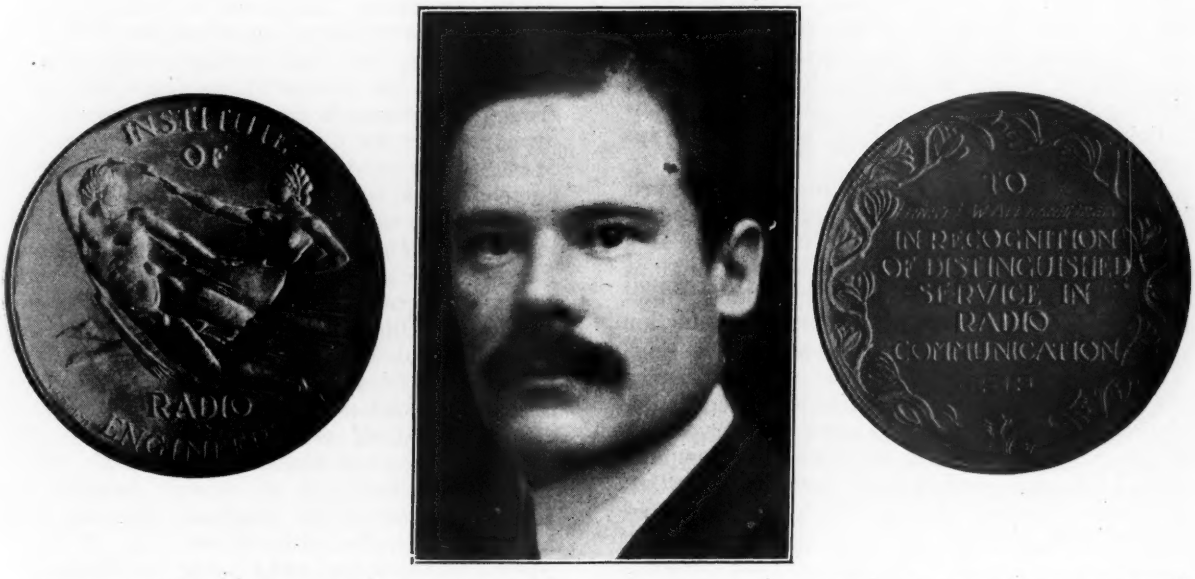
Mr. Alexanderson's appointments will not interfere with his position as engineer with the General Electric Co., except that he will divide his time between Schenectady and New York, the latter city being the headquarters for the Radio Corporation.

Mr. Alexanderson has gained world-wide fame in the inventive and radio fields. Of his many inventions, more than 100 are protected by patents in the United States and other countries. Foremost of these are his high-frequency alternator, magnetic amplifier, multiple tuned antenna and barrage receiver, instruments which made possible the sending of messages at the rate of 100 words per minute a distance of 3000 miles across the Atlantic Ocean.

It is these same instruments that will be used in the 16 powerful wireless stations to be installed by the Radio Corporation for its world-wide system. In addition he has improved the type of antenna, whereby it will not be necessary to extend it to almost unheard of heights. His antenna will be spread over an area of 16 square miles, the wires in this position doing the same work as previously stretched to great heights.

In addition to his wireless inventions, Mr. Alexanderson has also done much in other fields. While still in the Railway Engineering Department of the General Electric Co., he designed what has become known as the Alexanderson single-phase motor. This has been successfully used in single-phase motor cars and high-power locomotives and has been adopted in the latest designs of single-phase railway apparatus in Europe.

He has also developed a phase-converter system for changing single phase into polyphase and polyphase into single-phase power. He also designed the 1500-volt direct-current motors for the Melbourne, Australia, tramway, which was an international test case for the relative economy of single-phase and high-tension direct current. In these motors was introduced a new method of ventilation which has since been universally adopted. He also worked out the principles for a system of regenerative braking by d-c. series motors, now used in the electric locomotives of the Chicago, Milwaukee & St. Paul Railroad Co.



Obverse and Reverse Sides of Radio Institute Medal and Ernst F. W. Alexanderson, to Whom It Was Awarded.

He designed a high-tension variable-voltage-ratio synchronous converter, which is now in service on the New York Edison system. He developed several new methods of operating induction motors at variable speed. The results of this work are most prominently embodied in the design of the electrical equipment of the United States Battleship *New Mexico*, the first battleship of any nation so equipped.

Mr. Alexanderson is the son of Prof. A. M. Alexanderson and was born in Sweden on Jan. 25, 1878. He was graduated from the high school at Lund in 1896 and the next year studied in the University at Lund. From 1897 to 1900 he studied at the Tekniska Hogskolan, Stockholm, and from 1900 to 1901 in the Technische Hochschule at Charlottenburg, Berlin.

He came to America in August, 1901, and entered the employ of the C. & C. Electric Co. of New Jersey. The next year he came to Schenectady, N. Y., and entered the employ of the General Electric Co. as a draftsman. In

1904 he was transferred to the Engineering Department. His marked ability and many inventions won him promotion to consulting engineer in a short time, the position he still holds.

GENERAL ELECTRIC'S 1919 BUSINESS ESTABLISHES NEW HIGH MARK.

Record Gross of $231,000,000 Is Increase of $14,000,000 Over 1918 Figures.

General Electric Co. closed the biggest year in its history, Dec. 31, 1919, with billings amounting to $231,000,000, as compared with billings in 1918 of $216,815,277, an increase of over $14,000,000. Last year was the fourth consecutive one in which a new record for gross business has been established. Bookings, it is expected, will also show a slight increase over the $234,134,037 figures of 1918.

This showing is the more remarkable when the early months of 1919 are considered. As late as April the company was said to be figuring on a gross business of between $150,000,000 and $175,000,000 for the year. The abrupt cessation of orders in the months following the signing of the armistice left little ground for anticipating a business which would even approach the 1918 record.

At the end of the first six months, however, business had picked up so rapidly and production had so increased, that the predictions of a new record were warranted. These predictions were subsequently fulfilled by the greatest influx of orders and accompanying jump in production that the company has ever known.

Production costs will probably vary little from the 1918 rate, when all charges, including depreciation, consumed only 86.9 cents of every dollar of gross. The following table makes a comparison of bookings, billings and percentage cost of sales over a period of years with 1919 estimated on the basis of 1918.

Year.	Bookings.	Billings.	Cost of sales.	% Cost to gross.
1919	$235,000,000	$231,000,000	$200,970,000	87.0
1918	234,134,037	216,815,277	188,439,521	86.9
1917	246,778,491	196 926,318	167,921,778	85.2
1916	167,169,058	134.242,290	118,984,199	88.3
1915	98,385,891	85,522 070	76,898,182	89.9
1914	83,748,521	90,467,692	81.496,728	90.0
1913	111,819,142	106,477,438	96,207,833	90.3

In connection with the sale of $15,000,000 20-year, 6% debenture bonds to a syndicate of bankers by the General Electric on Feb. 6, it was announced that the company's net income for 1919, before allowance for excess profits tax, was $38,685,000. This compares with $32,982,071 in 1918, making last year the biggest year in earnings in the company's history. The debenture bonds are being offered at 94½ and interest to yield 6.50%. The proceeds of the issue will be used to pay $15,000,000 of the company's notes maturing July 1 next.

At the Feb. 6 meeting the directors voted to call a special meeting of the stockholders in Schenectady, N. Y., on March 16, at noon, to vote on a proposition to increase the authorized capital stock of the company from $125,000,000 to $175,000,000. Transfer books will close Feb. 17 and reopen March 17.

CENTRAL GROUP OF BELL TELEPHONE COMPANIES REORGANIZED.

Michigan, Ohio and Indiana Separated from Group —Changes in the Personnel Also Effected.

In 1911 Chicago was made the headquarters of the Central Group of Bell Telephone Companies, operating in Illinois, Indiana, Ohio, Michigan and Wisconsin. Similarly, New York was made the headquarters for the Eastern Group, operating in New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia and the District of Columbia. Six other groups were formed to cover the remainder of the United States.

Several months ago the New York Group was divided into three sections with headquarters at New York, Philadelphia and Baltimore, and it is now proposed to rearrange the Central Group by separating Michigan, Ohio and Indiana from the Chicago headquarters and putting them on a state basis.

The American Telephone & Telegraph Co., which is a large owner in all of the Bell companies, feels that the tremendous growth of the business in the past ten years has taken from the group a large part of its value. The investment in the Central Group has gone from $115,000,000 to $237,000,000, and the number of telephones from 833,000 to 1,648,000. It is felt that the state units are sufficiently large to tax the skill and application of any organization. Furthermore, it is more satisfactory to state commissions to deal locally than over state lines.

Edgar S. Bloom has been made president of the Cleveland Telephone Co. in place of B. E. Sunny, of Chicago, and this company will be operated in unison with the Central Union property in Ohio, of which Mr. Bloom has been president for some time.

Franz C. Kuhn, a native of Michigan and former member of the Supreme Court of Michigan, has been elected president of the Michigan State Telephone Co., and George M. Welch, vice-president and general manager.

Walter I. Mizner, who was originally secretary of the five companies in the Central Group, has been elected secretary and treasurer of the Michigan company and has been succeeded as secretary in the Chicago Telephone Co. by Elbert G. Drew.

AMERICAN SOCIETY OF MECHANICAL INSPECTORS HOLDS FIRST CONVENTION.

First Annual Meeting Held in New York and Largely Attended—Organization Is Outgrowth of War Activities.

All expectations were surpassed by the success that attended the first annual convention of the American Society of Mechanical Inspectors held in New York City Feb. 2-6. That the society is destined to fill an important place in the industrial development of the country is indicated by the hearty support that it is receiving, not only from those who are engaged in inspection work in the large manufacturing industries, but also from the promoters and managers of the

industries. Members registered at the convention from all parts of the United States and from all branches of industry. A large number of manufacturers of inspection equipment prepared exhibits for the convention.

The society had its origin in the demand by the war emergency for the production of accurately constructed machinery in large quantities. One of the most serious difficulties that confronted manufacturers who received war contracts was the shortage of trained inspectors which was so acute that the Ordnance Department was compelled to establish schools to train inspectors for inspection work. Much of this work had been done before 1917 by foreigners, who could not be trusted to continue the work after the war was declared. Realizing the importance of training inspectors for the industrial expansion to follow hostilities and of preventing foreigners from displacing citizens when hostilities ceased, Henry F. Winter and several associates organized the society of inspectors. How great its influence has been in retaining war-trained inspectors in the profession, in supplying American manufacturers with trained inspectors, in creating a new profession and even a new industry, namely, that of the manufacture of inspecting equipment, is shown by its growth and its support by manufacturers.

The importance of the society is indicated further by the fact that the manufacturers and members in the central part of the country have arranged for another general meeting and exhibit to be held in Detroit about March 15. Several chief inspectors from western automobile and other plants derived so much benefit from the exhibits and discussions that they asked the national officers to arrange a meeting so that their employes may obtain the benefit from it. Detroit was chosen as the most desirable location because of the large amount of inspection work that is done there. On account of the short notice, the date has been set only tentatively as March 15. It may be changed slightly to suit the convenience of the new chapter of the society that is being organized in Detroit.

Officers installed for the year 1920 include: Paul E. Theis, president; Ernst Mentor, Benjamin Gilpin, Arthur Knapp, Guy W. Vaughn, Earle Buckingham, and Albin Rothoff, vice-presidents; Herbert Bailey, treasurer; and Henry F. Winter, secretary. Offices of the society have been established at 10 West Forty-seventh street, New York City, where the society will maintain a permanent exhibit of inspection apparatus. The *Inspector*, the journal of the society, is sent to all members monthly.

PUBLIC HEARING CALLED ON PROPOSED CODE CHANGES.

Electrical Committee, National Fire Protection Association, to Hold Open Meeting in New York, March 23-24, to Discuss Revision of National Electrical Code.

The Electrical Committee of the National Fire Protection Association, which is charged with the duty of biennially considering and recommending changes in the National Electrical Code, has been busily engaged for about a year, through both its standing committees and technical subcommittees, in going over the various rules of the Code and suggesting changes therein where progress of the art manifestly warranted alterations. It has issued a large 27-page bulletin containing the reports of its ten standing committees and one special committee with their findings and recommendations. Pursuant to its customary procedure, the Electrical Committee has called a 2-day public hearing to be held in the rooms of the New York Board of Fire Underwriters, 123 William street, New York City, on March 23 and 24.

Shortly before this public hearing the Advisory Committee, consisting of Chairman Dana Pierce, Secretary Ralph Sweetland, and the chairman of the standing committees of the Electrical Committee, will hold a meeting to determine which committee reports and other suggestions and recommendations received too late for publication in the bulletin shall be presented for consideration at the public hearing and for subsequent action by the Electrical Committee.

A summary of the most important changes recommended in the bulletin referred to will be given in an early issue. A limited number of copies of the bulletin can be supplied by Ralph Sweetland, secretary Electrical Committee, N. F. P. A., 141 Milk street, Boston, Mass.

WISCONSIN PROPOSES NEW LAWS FOR AUTOMOBILE LAMPS.

Industrial Commission Is Holding Hearings to Get Views on Subject.

Proposed new standards regarding automobile lamps are under consideration by the Industrial Commission of Wisconsin, which last week held meetings at Superior, Eau Claire, Appleton, Milwaukee and Madison, to give automobile owners and dealers a chance to express their views on the law about to be enacted.

To aid it in its work the committee had the services of an advisory committee consisting of F. A. Vaughn, Illuminating Engineering Society, Milwaukee, chairman; Walter Alexander, engineer, Highway Commission; F. A. Cannon, executive secretary, Good Roads Association of Wisconsin; Sergeant Patrick J. Gleason, Milwaukee Police Department; Harry A. Apple, Wisconsin State Automobile Association; Adolph Graner, Milwaukee Automobile Dealers, Inc.; John M. Sell, Milwaukee, and John A. Hoeveler, electrical engineer, Industrial Commission.

The new statute after setting out the definitions of special terms used in regard to regulating motor-vehicle headlights and other lights provides that "Any automobile, motorcycle or other similar motor-vehicle, shall not be driven upon, or shall not occupy, any public highway during the hours from 30 minutes after sunset to 30 minutes before sunrise, unless it displays lighted lamps of the specified size, type and number and equipped as required by these orders."

Elimination of dangerous glare or dazzle from headlights is embraced in the order which requires that a light of not more than 2400 cp. intensity, measured at a distance 100 ft. in front of, and at a height of 60 in. above the surface on

which the vehicle stands shall be used. When measured at a distance of 100 ft. in front, 7 ft. to the left of the axis and 60 in. above the surface the light shall not be greater than 800 cp. intensity. The light emitted from any front lights may be white or tinted, but such tint shall not be red.

Every motor-vehicle, or trailer, shall be equipped with one tail-light on the rear, located to the left of the axis of the motor-vehicle, and this tail-light shall illuminate the entire license number-plate with a substantially white light, and display a red light visible for at least 500 ft. to the rear of the motor-vehicle.

The following specifications are made for size of electric lamps:

When electric headlights are used, they shall be equipped with vacuum type, tungsten-filament lamps, rated at 15 cp., or gas-filled type, tungsten-filament lamps, rated at 21 cp.

When electric side-lights are used, they shall be equipped with vacuum-type, tungsten-filament lamps, rated at 4 cp.

When electric tail-lights are used, they shall be equipped with vacuum-type, tungsten-filament lamps, rated at 2 cp.

In a note in the order it is explained that "because oil and gas-consuming lamps are not rated in candlepower, no specification as to size is given for these types of lamps. They may be used, however, if equipped so as to comply with the orders."

Dimmed lights are ordered on all motor-vehicles (except trucks which cannot proceed at a speed greater than 15 miles per hour, and motorcycles) when the motor-vehicles are standing at a curb or roadside, and when only one light is displayed, it shall be to the left of the axis of the motor-vehicle.

MATERIAL HANDLING INDUSTRY MEN TO MEET IN NEW YORK CITY.

The annual meeting of the Material Handling Machinery Manufacturers' Association will be held in the Waldorf-Astoria hotel, New York City, Thursday and Friday, Feb. 26-27 next. One of the primary purposes of the meeting is to focus attention on the fact that the science of handling materials is rapidly fashioning an in-

The morning session on Thursday will be devoted to reading of annual reports and election of seven new members of the board of governors, with a luncheon at 12:30 noon, with addresses by well-known speakers. At the afternoon session several papers on "Uses and Misuses of Material Handling Machinery" will be read, followed by discussion.

Friday morning will be devoted to a meeting of the advertising council at which papers will be read and discussions take place on "Association Publicity." Friday afternoon the plans of the association's work for 1920 will be outlined followed by papers and discussions on "Material Handling Machinery Installations," illustrated with motion pictures of machinery at work.

All the meetings are open to manufacturers of machinery or equipment and their representatives and engineers and others interested in mechanical handling, whether members of the association or not. Zenas W. Carter, 35 West 39th street, New York City, is secretary and manager of the association.

CONSTRUCTION INDUSTRIES TO HOLD ANNUAL MEETING.

The National Federation of Construction Industries announces its first annual meeting on March 24, at the Hotel Sherman, Chicago. It promises to be of extraordinary interest and fundamental concern to everyone engaged in construction. Invitations to be present are extended to every national, regional and local association, and to all producers, manufacturers and distributors of construction materials, machinery and supplies, contractors, architects, engineers, and financial interests concerned with construction.

An interesting program has been outlined and national and international authorities will speak on: Freight Traffic, Standardization in the Construction Industry, Foreign Trade, Financial Relations, Jurisdictional Awards, Housing and Americanization.

N. E. L. A. COMMITTEES PREPARING REPORTS.

The Committee on Electrification of Steam Railways, of the National Electric Light Association, of which Frank M. Kerr, vice-president of the Montana Power Co., is chairman, is at work on an elaborate report to be presented at the convention at Pasadena. The report will consist of a general survey of the subject containing statistics and information to central-station and railway operatives.

The Committee on Electrical Resources of the Nation, of which M. S. Sloan, president of the Brooklyn Edison Co., is chairman, is preparing an elaborate report on the power conditions of the country. Col. La Come, ex-secretary of the committee, is devoting his entire time to the development report.

COMING CONVENTIONS.

American Institute of Electrical Engineers, Midwinter convention, New York City, Feb. 18-20. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

Central Electric Railway Association. Annual meeting, Louisville, Ky., Feb. 26-27. Secretary, A. L. Neereamer, Indianapolis, Ind.

Material Handling Machinery Manufacturers Association. Annual meeting, New York City, Feb. 26-27. Headquarters, Waldorf-Astoria hotel. Zenas W. Carter, secretary, 35 West 39th street, New York City.

American Electrochemical Society. Annual convention, Boston, Mass., April 7-10. Friday, April 9, joint session with American Institute of Electrical Engineers on "Electrically Produced Alloys." Secretary, Joseph W. Richards, Bethlehem, Pa.

American Association of Engineers. Annual convention, St. Louis, Mo., May 10 and 11. Headquarters, Planters Hotel. Secretary, C. E. Drayer, 63 East Adams street, Chicago.

National Electric Light Association. Annual covention, Pasadena, Cal., May 18-21. Headquarters, Hotel Huntington. Acting secretary, S. A. Sewall, 29 West 39th street, New York City.

National Association of Electrical Contractors and Dealers. Annual convention, Baltimore, Md., Oct. 6. Secretary, W. H. Morton, 110 West 40th street, New York City.

Commercial Practice

Edison Club—Electrically Made Potash—Utility Situation —Electric Heat and the Influenza—Utility Rate Increase

FELLOWSHIP AMONG EMPLOYES IS KEYNOTE OF EDISON CLUB.

Chicago Utility Concern Plans to Restore Before the War Relationship Through Organization.

To make friends of Commonwealth Edison Co. workers from president to office boys and from superintendents to the water boys on the pole line gangs, is the main object of the Edison club, an organization less than three months old, and to which more than 3000 Commonwealth Edison workers already belong.

The Edison club was organized by the employes in order to get together, to promote their acquaintance, to develop the human side of the establishment, and, in addition to this, to restore to the organization the goodfellowship and loyalty that was in the organization before the United States entered the World War and which, like in every other large organization, was largely nullified by the constant changing of the personnel of employes during the war period.

The club was organized last November with William A. Durgin as the leader in the movement. He was made first president of the club, with F. N. Savage as vice-president, E. S. Butt, secretary, and W. A. Fox, treasurer.

The Edison club is connected with the Edison Company Section of the National Electric Light Association, many of the club members being active members of the section, while all club members become associate members of the Edison N. E. L. A. section through their club connection.

The club's first "get together" meeting and entertainment was held at the Congress Hotel, Chicago, on Nov. 28 and this meeting was so large that it was necessary to repeat the meeting and entertainment on the following Monday night. On Dec. 23, a Christmas party was held at Medinah Temple, Chicago, and that big hall was filled with club members and their families, about 4500 attending the "little" party. In fact, one of the big problems facing the club is to find a meeting place that is large enough to accommodate the throngs that turn out for the monthly meetings.

The last meeting of the club was held in three sections, each side of the city having its party on a different night. The company pays most of expenses of the meetings and entertainments, the membership cost to the employes being limited to $1.50 yearly dues.

The success of the three meetings held by the new club already makes it rank as one of the most important industrial clubs in the country and is doing a great work in developing solidarity and good-feeling in an industrial family.

One thing that adds to the popularity of the Edison club is the fact that it steers clear of paternalism, or company influence, a thing on which many similar organizations have gone down to wreck on. In the Edison club case industrial democracy was not "wished" on the members by the management but was evolved by the working force itself.

Behind the club are the other activities of the company, all set in motion for the purpose of developing the human side of business and bringing about co-operation, one of the real keynotes of the day. The Commonwealth Edison Co. has a symphony orchestra of 100 members, with one of the largest musical libraries in the city, an organization that through its public appearances has been termed by critics the finest orchestra supported by any corporation in the country.

Another Edison attraction is the encouragement of sports and health-giving recreation. One of the biggest events each year is the annual field day at Riverview park, Chicago, and this year under the auspices of the Edison club it promises to be bigger than ever. In addition, during the different seasons the employes have bowling and baseball leagues, golf, rifle and tennis clubs and, in fact, the organization is interested in all sport activities.

USE OF ELECTRIC POWER FOR PRODUCING POTASH FROM KELP.

Description of Processes and Electrical Equipment Utilized in Plant of Department of Agriculture at Summerland, Calif.

While it has been recognized for some time that many chemicals of commercial value can readily be derived from kelp and other sea weeds, there has been no incentive to investigate this field on account of cheap production from other sources. On account of the war, the usual source of these chemicals was cut off or at least restricted and in this emergency many unique processes came to light. On the Pacific Coast, writes A. B. Cram in *Edison Current Topics,* the monthly publication of the Southern California Edison Co., several plants for obtaining potash from kelp were erected, but it was soon learned that this method of producing potash could not compete with other sources when wartime conditions passed, unless profit could be found in the by-products, such as charcoal, sodium chloride, iodine salts, ammonia and creosote.

During the year 1918, 400,000 tons of raw kelp were harvested along the coast of Southern California. It has been demonstrated that the kelp promptly restores itself and can be harvested repeatedly. It may be said with certainty that these waters may be harvested three or four times each year, giving a production of 500,000

tons annually without apparent injury to the beds.

The experimental kelp-potash plant of the United States Department of Agriculture at Summerland, Calif., six miles south of Santa Barbara, was built to determine the feasibility of establishing an industry for the extraction of potash and by-products on a commercial basis. The plant is run on a commercial scale incidental to experimental work. On an average, 80 tons of dry kelp in a day of 24 hours is processed. The total connected load of this plant is 250 hp. which with this load factor makes very attractive business for the company.

The details of this process are unusual and consequently very interesting. A large barge with a derrick on one end to operate the cutters is forced through the kelp beds. The huge knives cut the kelp, which is conveyed to the barge on a belt at the rate of 30 to 40 tons per hour. The loaded barge is then propelled to the plant where a grab fork operated by a 30-hp. motor lifts the kelp and drops it in a hopper. From this it is fed to a chopper where it is cut in short lengths and then delivered to a conveyor on which it is carried into two driers. Here the kelp is partially dried and then changed into a third drier where the process is completed. The chopper is operated by a 15-hp. motor, the conveyors by a 30-hp. motor, and the driers by a 15-hp. motor. Heat is furnished by oil burners electrically driven and the air circulated by two blowers using 20 hp.

The dried kelp is then delivered into a continuous rotary incinerator where it is charred, the result being carbon and charcoal impregnated with potash and sodium salts. This process and auxiliary machinery requires a 5-hp. motor. The char is then subjected to a special heat treatment in retorts which produce an activated char from which discolorizing carbon is subsequently produced. A total of 7 hp. is used for this process. The char so produced is refined for the production of potash salts, discolorizing carbon and other by-products. None of this material is marketed in the form or kelp ash, which is a low grade fertilizer, as was done by various kelp reduction plants during the recent war.

The char is then run into a leaching process called a lixiviator, which is a mechanical filter press of the rotary, vacuum type combined with leaching troughs in series with each other, so that the material undergoing extraction may be leached and filtered successively. The char then passes through the apparatus by gravity in a continuous stream against a current of brine lifted by pumps operated with an electric drive as a part of the filter press equipment. Continuous leaching is effected in an entirely mechanical manner; kelp charcoal enters one end of the apparatus, and a press cake is discharged from the other. The charcoal obtained from this process represents a higher degree of value than any other commercial carbon obtainable at the present time. It represents a by-product of value and of great usefulness in a variety of industries and offers promise of a highly remunerative product. In the meantime the lower grades of carbons are being extracted with hot hydrochloric acid and water. For this purpose the press cake, from which water soluble salts have already been removed by the lixiviator, is delivered into acid-proof tanks where it is given successive treatments with acid. It is then lifted into the system of tanks as a sludge by means of a centrifugal pump, is agitated by compressed air, and is filtered over vacuum; all of which is electrically driven.

After the elimination of sulphates the brine resulting from the leaching of kelp charcoal contains only the chlorides of sodium and potassium, which are separated by the so-called hot-cold method. Thus sodium chloride is obtained from the evaparator and potassium chlorides from the crystallizer. These chlorides are circulated back and forth through the apparatus until concentrated salts of iodine are obtained. These are washed and then passed through a rotary hot air dryer, and packed in 100-pound sacks for shipment.

The residue from the above leaching process consists of activated carbon, charcoal and other soluble mineral matter. This residue called a filter cake is then subjected to a treatment of hydrochloric acid and thoroughly washed in water and dried in a hot air dryer; the final product being nearly pure charcoal. This product is a decolorizing carbon which has wonderful properties in the making of commercial dyes.

ELECTRIC HEAT PROVES OF VITAL USE DURING INFLUENZA.

Interesting Application Alleviates Troubles and Hastens Recovery.

The recent influenza epidemic, composed partly of influenza and partly of pneumonia, has usually come on in the form of a cold in the head, which has rapidly become worse and developed into bronchial and lung trouble. The first requirement to abate this condition is to go to bed, keep warm and expel the cold. This means warmth inside and outside; fresh air and humidity.

In a recent case which was called to particular attention, it happened that a 3-year-old child was sick with such a severe cold that it was impossible for him to breathe through his nose; in fact, he lay and gasped for breath. Medicine, hot applications, etc., failed to improve matters. The bedroom was wired for electric light but not for gas. The immersion type heater had been loaned to a neighbor, where four were sick with pneumonia. As humidity offered a promise to improve conditions, the electric flat iron was inverted in a metallic tray (to prevent fire hazards) upon the floor beside the bed, and turned on.

A quart of water was boiled on the kitchen gas, while a smaller vessel, containing about half a pint, was also boiled, so as to heat the vessel thoroughly. The smaller vessel was then taken upstairs and placed upon the flat iron so as to maintain its temperature. When the larger quantity of water was boiling, it was also carried upstairs, the water in the smaller vessel, now gone off the boiler, was thrown away, and the water in the kettle poured in to the extent of about half a pint. The heat storage capacity of the larger body of water was just that the water placed upon the flat iron soon came up to a boil. More water was added as evaporation occurred.

A mixture of thymol and eucalyptus oil was added to the mixture, about half an ounce of oil to a half pint of water.

Boiling water in this way showed that there is one location upon the flat surface of the iron where the heat is greater than any other; it pays to determine this spot. It required about half an hour to evaporate half a pint of water, current being on for about twenty minutes of the time, the stored heat keeping the water boiling for more than five minutes after current was turned off. The iron was a 5-lb. iron, rated at 7 amperes and 110-115 volts. The bedroom measured about 16 by 12 ft. and 10 ft. in height. During the humidifying, the outdoor temperature was cold, the internal temperature about 75 deg.

The evaporation of the water so brought up the humidity, plus the effect of the thymol and eucalyptus oils that before the half pint of water had been evaporated, the child's nasal passages had been so cleared that breathing was not only feasible but easy. The chief value of this incident is that electric heat may be used anywhere, where wiring exists, whereas had electricity not been available, an oil burner, which consumed oxygen, would have been necessary. The value of humidity is also worthy of note, since humidity tends to prevent rather than encourage, alleviate rather than accelerate catarrhal troubles and diseases of the mucus membranes.

PUBLIC HAS MORAL OBLIGATION IN UTILITY RATE INCREASE.

"The gas company is an indispensable part of the community which it serves. Its personnel is composed of citizens, taxpayers and business men," declared Francis H. Sisson, vice-president of the Guaranty Trust Co., New York City, when speaking recently on the subject of public utility securities.

"The mass of our citizens ought to consider," continued Mr. Sisson, "that the gas companies and the public utilities generally, like all of us, have had to undergo the hardships of war; that in the face of steadily rising costs and of continually increasing wage scales, with corresponding increases in rates in only a few places, the public utilities have continued an uninterrupted service to the public.

"The American people must awake to the folly of forcing the net earnings of public utilities—gas, telephone, electric and traction companies—to decline still further as a result of increasing operating expenses and stationary returns, and recognize that if the public utilities are under moral obligation to serve the public, the public is also under moral obligation to support those public utilities. The plight of the traction companies has taught the nation a dear lesson."

AN APPEAL THAT HITS THE MARK.

A Central-Station Advertisement That Reaches Local and Prospective Industrial Managers.

The United Electric Light & Power Co. is educating the residents of New York, and the industrial managers especially, in the value of central-station service, and the importance of the availability of ample, inexpensive power to prospective industries starting up in the great industrial center of Manhattan.

The accompanying illustration shows a typical advertisement appearing in a recent issue of the New York *Sun and Herald*. This advertisement visualizes the vast power resources behind

Low Cost Electrical Power
for you
in unlimited quantity, dependably delivered from the generating plant of The United Electric Light and Power Co.
More than adequate for the needs of the great industries of Manhattan. And more efficient and lower in cost than any which is privately manufactured from installations that represent large and unwarranted investments.
Why carry the mental burdens involving coal shortage, liability, insurance and an endless number of others, when a more efficient and less costly source of power is available for you?
Our power engineers will give you facts, figures and details concerning United Service for your premises. Your inquiry and their service will entail no obligation whatever.
The United Electric Light and Power Co.
130 East 15th St.
Generating Station
West 20lst Street and Harlem River
District Offices and Show Rooms
59th Street and Broadway
116th Street and Broadway

Advertisement for Selling Idea of Central-Station Service to Industrial Plants in Manhattan.

the machinery of industry. It attracts attention by being directed to "for you." In a nutshell, it is stated that central-station service eliminates all the troubles, uncertainties and complications of individual power supply, and makes available more reliable, cheaper, less troublesome power supply over service lines. It appeals to the industrial plant now fighting against high wages, high fuel costs and inherent difficulties. It appeals to prospective industries that seek a locality where ample power supply exists.

SUES TO RECOVER INCOME TAX.

Suit to recover nearly $1,000,000, paid under protest to the Government as munition manufacturer's tax, has been filed by the Westinghouse Electric & Manufacturing Co. in the United States District Court at Pittsburgh. The company alleges taxes totaling $842,671 were wrongly assessed against it because it was doing the work for two other concerns and the British Government. The Washington Steel & Ordnance Co. and the American Steel Foundries are the companies for which the work was done, according to the petition filed in the suit.

Contracting-Construction

Revised Estimate Forms—Wire and Cable Conduit Sizes—Radio-Station Hazards — Contractors' Annual Meeting

ESTIMATE FORMS FOR ELECTRICAL CONTRACTORS REVISED AND SIMPLIFIED.

Chicago Electrical Estimators' Association Makes Its Standard Estimating Forms More Valuable and Convenient in Their New Revised Form.

The Chicago Electrical Estimators' Association, which has done so much in the past to help put electrical contracting on a firmer basis, especially through the development of scientific methods for preparing estimates, has just revised its estimate forms with the combined view of simplification and at the same time increasing their value and utility.

A year or so ago the Association prepared and published a copyrighted series of seven estimate sheets, covering practically any interior electrical contracting job. During the past year this set of forms has been given a great deal of critical study at the numerous meetings of the Association with the result that the forms have been reduced to five instead of seven sheets and changes have been made here and there which at the same time simplify the entry of the proper items and also provide additional lines and columns for entry of items formerly not included. The revised forms are briefly described as follows:

The first sheet, which is designated as Form 1, is the title page of the estimate and serves as a complete record of all information pertaining to the individuals or firms and their respective addresses with whom the bidder will deal. It also contains a description of the plans and specifications for identification upon award of the contract. The lower part of this sheet also serves as an index of the specifications, thus enabling one quickly to find the page upon which description of any respective item can be found.

The second sheet (form 2) is used for listing the various outlets and their capacities and total wattages. The horizontal lines are numbered to facilitate following an item across the sheet. A simple code is used for this numbering: oo is intended for the sub-basement, if there is one; o is for the basement; then the various successive floors follow in ordinary numerical order. Generally it is intended that the front of the sheet be used for outlets and the back of the folded portion be used for the circuit enumeration.

This sheet is divided into an upper and lower portion, the former being intended for the lighting outlets, and the latter for telephone, signal, fire-alarm or other low-tension work. Or, if there are two lighting risers and their size is not given on the plans or in the specifications, the two groups of lighting outlets can be listed separately on the two halves of the sheet. A sketch of the feeder and riser layout as figured can then be made on the back of the main part of the sheet, which is ruled in squares for convenience.

The third sheet (Form 3) is used for describing and listing the feeders, there being 16 columns on the front and 14 on the back of the sheet for tabulating the respective quantities of each size of wire and conduit, as well as elbows, unilets, junction boxes, etc., that may be required.

The fourth sheet (Form 4) is the pricing sheet, on which are entered the various materials and their respective quantities for pricing up. There is a column, first of all, for listing of the material; next a column for the respective quantity of such material; then a column for the unit prices, followed by a column for the extension thereof, then a column for entering the labor unit cost of the respective material, followed by its extension. Both at the left and at the right there are numbers for all the lines for convenience in checking.

Finally, on the fifth sheet (Form 5), which is the recapitulation sheet, there is provided space for certain statistical information relative to the number of outlets, wattage, number of circuits, number and horsepower of motors, total labor, etc., for the convenience of the one who either compiles the statistics on the job or for providing a means of checking the estimator's cost by the sales manager or proprietor as the case may be. There is also a list of incidental expenses connected with the job, such as a bond premium, pro-rata charges, insurance, watchman, telephone, etc. There are also entered items known as nonproductive labor, such as handling materials, travel time (that is, time consumed by the men in traveling to the job for which it may be necessary on some jobs to allow them pay), also delays and conditions that are apt to be met with on the job, which will necessitate a greater amount of time on the part of the workmen than the respective quantity of materials would require if conditions on the job were favorable. The remainder of the sheet contains items for summarizing the main classification of items constituting the estimate, and there is also left considerable space for remarks.

The Chicago Electrical Estimators' Association has had the new revised forms copyrighted and is now ready to supply them in quantity. It is believed that electrical contractors will find the merits of these forms such as to make them the standard in use. Prices and other further information regarding these forms can be obtained from W. Mullery, secretary of the Association, whose address is care of F. L. Newberry Electric Co., 14 East Jackson boulevard, Chicago.

SIZES OF CONDUIT FOR THE INSTALLATION OF WIRES AND CABLES.

New Tables Proposed for 1920 Edition of the Code, as Recommended by Inspectors' Association.

Rule 28*i* of the National Electrical Code gives minimum sizes of conduit for different sizes of conductors from No. 14 to 2,000,000 cir. mils. The table gives the minimum sizes for any number of conductors up to four. However, there are many installations made in which the number of conductors runs beyond this figure and in which the size of conduit is a question.

With a view to remedying this situation the Rubber-Covered Wire Committee of the Western Association of Electrical Inspectors, of which V. H. Tousley is chairman, extended the table so that it includes minimum conduit sizes for any number of conductors up to nine. The new table has been referred to the Electrical Committee of the National Fire Protective Association for adoption and inclusion in the 1920 Code.

TWO-WIRE AND THREE-WIRE SYSTEMS.

Size of conductor.	Number of conductors in one conduit. Minimum size of conduit. Inches								
	1	2	3	4	5	6	7	8	9
14	½	½	½	¾	¾	1	1	1	1
12	½	½	¾	¾	¾	1	1	1	1¼
10	½	¾	¾	1	1	1	1¼	1¼	1¼
8	½	¾	1	1	1	1¼	1¼	1¼	1¼
6	½	1	1¼	1¼	1½	1½	2	2	2
5	¾	1¼	1¼	1¼	1½	2	2	2	2
4	¾	1¼	1¼	1½	2	2	2	2	2½
3	¾	1¼	1¼	1½	2	2	2	2½	2½
2	¾	1¼	1½	1½	2	2	2½	2½	2½
1	¾	1½	1½	2	2	2½	2½	3	3
0	1	1½	2	2	2½	2½	3	3	3
00	1	2	2	2½	2½	3	3	3	3½
000	1	2	2	2½	3	3	3	3½	3½
0000	1¼	2	2½	3	3	3	3½	3½	4
200,000	1¼	2	2½	2½	3	3	3½	3½	4
225,000	1¼	2½	2½	3	3	3½	3½	4	4
250,000	1¼	2½	2½	3	3	3½	3½	4	4½
300,000	1¼	2½	3	3	3½	3½	4	4½	4½
350,000	1¼	2½	3	3½	3½	4	4½	4½	5
400,000	1¼	3	3	3½	4	4	4½	5	5
450,000	1½	3	3	3½	4	4½	4½	5	6
500,000	1½	3	3	3½	4	4½	5	5	6
550,000	1½	3	3½	4	4½	5	5	6	6
600,000	2	3	3½	4	4½	5	6	6	6
650,000	2	3½	3½	4	4½	5	6	6	6
700,000	2	3½	3½	4½	5	5	6	6	
750,000	2	3½	3½	4½	5	6	6	6	
800,000	2	3½	4	4½	5	6	6	6	
850,000	2	3½	4	4½	5	6	6		
900,000	2	3½	4	4½	5	6	6		
950,000	2	4	4	5	6	6	6		
1,000,000	2	4	4	5	6	6			
1,100,000	2½	4	4½	6	6				
1,200,000	2½	4½	4½	6	6				
1,250,000	2½	4½	4½	6	6				
1,300,000	2½	4½	5	6	6				
1,400,000	2½	4½	5	6					
1,500,000	2½	4½	5	6					
1,600,000	2½	5	5	6					
1,700,000	3	5	5	6					
1,750,000	3	5	5	6					
1,800,000	3	5	6	6					
1,900,000	3	5	6						
2,000,000	3	5	6						

For sizes not greater than No. 10 B. & S. gage, one more conductor than permitted by the above table may be installed in the specified conduit, provided the conduit is not longer than 30 feet, and has not more than the equivalent of two quarter bends from outlet to outlet, the bends at the outlets not being counted.

STAGE POCKET AND BORDER CIRCUITS.

This table must not be used for other than stage pocket and border circuits, except by special permission of the inspection authority having jurisdiction.

Size of conductor.	Maximum number of conductors in conduit. 1"	1¼"	1½"	2"	2½"	3"
14	11	19	26	43	61	95
12		15	21	34	50	77
10		12	16	27	38	60
8			13	22	31	49
6					14	22

For groups or combinations not included in the above tables, consult the inspection authority having jurisdiction. For such groups or combinations, it is recommended that the conduit be of such size that the sum of the areas of the several insulated wires will not be more than 40% of the area of the conduit raceway.

The sizes apply only to complete conduit systems and do not apply to short sections of conduit used for the protection of exposed wiring from mechanical injury.

Experiments made in connection with an investigation of the demand-factor indicated that where a very large number of the smaller size wires were contained in a large conduit, and where these wires were allowed to carry their full rated current for any great length of time, the inner wires of the group would reach a temperature which would soon destroy the insulation and possibly even ignite it. For this reason the table was limited to not more than nine wires.

In case special permission is requested for more than nine wires in a conduit the committee recommended that in no case should these wires be permitted to carry a total current which would have a greater copper loss than occurring with the largest wire permitted in the particular size conduit under consideration. As an illustration:

The table shows 43 No. 14 wires in a 2-in. conduit. One 1,000,000-cir. mil wire is allowed in the same size conduit. The carrying capacity of 1,000,000-cir. mil wire is 650 amperes, the resistance is .0000108 ohm per foot. The C^2R loss is $650^2 \times .0000108 = 4.563$ watts. With 43 wires in the conduit each wire should have C^2R loss of $4.563 \div 43 = .106$ watt. The resistance of No. 14 wire is .002628 ohm per foot. $.106 \div .002628 = 41$. The square root of 41 is 6.4. Therefore, 43 wires carrying 6.4 amperes will have the same C^2R loss as one 1,000,000-cir. mil wire carrying 650 amperes.

HIRAM PERCY MAXIM ON RADIO-STATION HAZARDS.

Well-Known Inventor and Radio Expert Discusses Fire Hazards of Amateur Stations.

At the recent meeting of the Western New England Association of Electrical Inspectors there was presented a paper by Thomas Henry Day, president of this organization, on the subject, "Investigation of Fire in Private Radio Station." This paper was published in the ELECTRICAL REVIEW of Jan. 10, 1920, and has aroused much interest, not only among electrical inspectors but also among radio experts. Mr. Day has received a communication throwing much light on this subject from Hiram Percy Maxim, well-known as the inventor of the Maxim "silencer" and countless other inventions and president of the American Radio Relay League. Through the kindness of Mr. Day we are permitted to publish Mr. Maxim's letter, which follows:

"I have your paper and also the papers of the other gentlemen on the hazard connected with radio transmitting apparatus. I have particularly noted the theories presented and viewed them from the standpoint of my own experience with radio apparatus during the past six years.

"It seems to me that it might be well to state the premises and then discuss the question of protection from a practical and simple standpoint.

"As the president of the American Radio

Relay League, which is an organization of amateur radio-station owners in every state of the Union and in most of the provinces of Canada, I am in contact with amateur radio very intimately. Possibly my position gives me an unusually broad knowledge of the conditions surrounding an amateur radio station.

"Before the war closed up amateur stations, there were over 8800 transmitting stations licensed by the United States Government in the various states. During the war, some 20,000 young men were trained by the Government for radio work and most of these are now back in civil life and either have erected or are erecting radio stations. The magnitude of the thing is therefore considerable. An idea of this may be judged by the fact that one single manufacturer of amateur radio apparatus states that he believes that he will sell during the year 1920 $250,000 worth of apparatus to amateurs. By the close of 1920 I should expect to see not less than 10,000 transmitting stations in the United States and by the close of 1921 I believe there will be upwards of 20,000.

"The importance of amateur wireless is not appreciated by the public. For example, it is probably not generally known that at the present time many hundreds of messages are transmitted every night in the year. Appointments are made, goods are bought and sold, and correspondence is conducted by amateur radio over distances extending from coast to coast. Arrangements are now being perfected to handle traffic into Alaska, and before the year is up it is most likely that amateurs in the various states will be able to have messages relayed as far as Sitka, Alaska, and answers received back in a few hours' time. This is all mentioned so that your insurance association may judge the magnitude of this new development.

"It seems to me that we cannot hope to insure that every amateur radio installation is so made that there will be no fire hazard, under the present Code, no matter how we proceed. It is unavoidable that these young men will arrange wiring themselves. In many cases it seems most likely that dangerous combinations will creep in. In other words, it seems to me we must recognize that hazardous conditions will occur. Our only recourse is to accept this as unavoidable, and to meet the situation by requiring the installation of protecting devices wherever amateur radio transmitting is done.

"Now as to these protecting devices: It has been established that parallelism between the conductors of the transmitting circuits and the house lighting circuits is one of the principal causes of breakdown in the ordinary house wiring. This parallelism sets up high-voltage conditions in the lighting circuits which are very complex and difficult to understand. We know the high voltage is produced, however, and it seems to me we can neglect for the moment how it is produced. Our problem is to find how to render this high voltage harmless. I am not prepared to suggest a permanent solution but I have known trouble to be entirely overcome by using high-resistance grounding systems across which condensers have been connected. It means that there is a small discharge occurring all the time, but this is negligible. Any high voltage overcomes this resistance instantly. It acts very effectively to drain off any dangerous potentials. I believe it would be very difficult to blow a lamp socket or a fuse when these high-resistance leaks are installed. I am not prepared, however, to insist that they would positively eliminate every hazard, because I do not feel that I know enough yet about this situation to make such a claim.

"There is another fire hazard besides this. It comes from a wholly different source and is not connected in any way with house lighting. It arises from sparks produced in conductors such as gutter pipes which happen to be insulated from ground, and in which the nearest path to ground is along a dry wooden part of the house construction. Under these conditions, a spark will jump and ignite the wood and start a fire. The correction for this is to require the grounding of gutter pipes and other similar metal objects in which there is any likelihood of induced currents being set up by the transmitting apparatus."

Mr. Day is anxious to hear from others who are informed on this particular form of hazard. Communications to him should be addressed as follows: Thomas Henry Day, 59 Deerfield avenue, Hartford, Conn.

J. NORMAN PIERCE HEADS CHICAGO CONTRACTORS' ASSOCIATION.

Organization Asks for Co-operation of Other Branches of Industry.

At the annual meeting of the Electrical Contractors' Association of Chicago, held Jan. 14, the following were elected as officers of the organization for the ensuing year: J. Norman Pierce, president; J. O. Kelso, treasurer; O. F. Burkett, assistant treasurer; J. W. Collins, secretary, and A. H. McGrew, assistant secretary. The following compose the new Executive Committee: J. Norman Pierce, chairman; W. A. Jackson, L. H. Lamont, L. D. Grey, F. S. Leasure, A. Wagner, Tom Meade.

The association holds its meetings on the second and fourth Wednesdays of each month following the noon luncheon at the Randolph Hotel. The organization feels that in the past the different branches of the industry have not co-operated as fully as they should and it extends to the trade an invitation to co-operate with it freely and to call upon it for any assistance that is in its power to give.

In answer to recent complaints of various manufacturers in regard to certain requirements of the electrical code of the City of Chicago, Secretary J. W. Collins announces that he is taking this matter up with all the branches of the industry who might be affected by these changes, and requests that any suggestions manufacturers or dealers have in regard to the present code or changes that might be made at the next meeting of the joint code committee be forwarded to him. Mr. Collins says he will be glad to get the names of all manufacturers and dealers who are interested in code changes and will endeavor to keep them informed of any changes that may affect their business.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 475.—Pricing Motor Repair Work.—Can some of the readers through the questions and answers column give me the best methods of pricing repair work on electric motors, armature winding, etc., and the best methods of setting the selling price of insulating materials and of magnet wire?—D. D., Indianapolis, Ind.

No. 480.—Depreciation Reserve of Utilities.—What is the present prevailing practice on the part of public service commissions as to how the depreciation reserve of public utilities shall be kept? Is this fund always kept separate and distinct from other sinking funds or reserves? Do the commissions approve lumping it in with the general reserve of the utility?—A. E. M., Little Rock, Ark.

No. 482.—Cleaning Power-House Condensers.—What routine methods are usually employed for cleaning condenser tubes? We find that the dirt in our tubes changes at different times of the year, sometimes causing a hard brittle scale, at other times forming a slimy mass, like vaseline. How can this condition be overcome? What methods of cleaning are usually used?—J. M. McN., Tacoma, Wash.

No. 484.—Gilsonite.—Can someone advise me as to what Gilsonite is? What are the properties of this material and where is it found? I understand that electrical insulating paints are made from this Gilsonite. If this is true, is the paint a good one for the windings of electrical machines?—B. D. M., St. Joseph, Mo.

Answers.

No. 481.—Installing Lead-Covered Cable.—We anticipate installing about forty lead-covered three-phase cables in a building. These cables enter from underground to the basement and then are routed upward at one end where they pass to a switchboard for distribution. It seems that the usual method of bringing in lead-covered cables along the floor and covering them with cement is not only troublesome at time of installation, but creates needless difficulty if ever cable repairs become necessary. Would some one familiar with this form of work give some information as to a cheaper and more convenient way of installing these conductors?—C. M., Kansas City, Mo.

Answer B.—Lead-covered cables should be installed in conduit (preferably fiber duct) which when covered in concrete will make a permanent job and permit cables to be pulled out and others pulled in at any later time. Where these cables come near to the switchboard a gutter should be built in the floor large enough to admit all the cables and permit them to be changed about if occasion should require this in the future. This gutter or pit should be lined with concrete and provided with an iron plate cover for access to the cables when necessary. The cables should be supported on cable hangers, if in several tiers and should have large-radius bends where turns are necessary. Fiber ducts should be provided where the cables pass out of the side of the gutter or pit toward the board, these ducts ending in fiber elbows bringing the cables to just above the floor right back of the switchboard. The pit serves just like a pull box in regular interior construction and makes it easy to pull the cables in and reroute them if changes are necessary later on.—E. P. G., Baltimore, Md.

No. 483.—Oil for Compensators.—(a) Is the oil used on railroads and known as "Signal Oil" a satisfactory oil for filling the starting compensator tank of a 10-hp., 220-volt, three-phase, 60-cycle motor? The motor always starts without load but will blow a 75-ampere fuse and I believe it even blows a 90-ampere fuse at times. One of the compensator coils burned out after about two weeks' operation, but has been repaired and is again in service with the signal oil in the tank. (b) Would you advise the use of what is known on the railroads as "Black Car Oil" for filling the compensator tank for 10 to 25-hp., 220-volt, two or three-phase motors? Which would be the most satisfactory for the above, "Black Car Oil," "Signal Oil" or "Gas Engine Oil?"—J. B., New York, N. Y.

Answer A.—I would advise J. B. to call in an electrician who understands the principle of the manufacture and installing of a-c. compensators for starting polyphase motors. The compensator in question is undoubtedly connected wrong as a 10-hp., three-phase motor connected correctly in circuit with its compensator on a 220-volt line without load should only take about 30% of the full-load current. As regards the oil in the tank of compensator he mentions this should have no effect on the autotransformer coils in connection with the compensator. The compensator switch contacts are immersed in oil for the purpose of breaking the arc at make and break, at such times as the compensator switch is thrown in and over from starting to running point. As regards the quality of oil to use, I would advise him to order same from the compensator manufacturer.—W. T. L., New York, N. Y.

Answer B.—Manufacturers of electrical devices requiring the use of an insulating oil absolutely refuse to guarantee any such apparatus unless such oil is manufactured by or else recommended by them. Oil is used in such devices as transformers and switching apparatus for several reasons, as follows: (1) It acts as a cooling medium in quenching the arc; (2) as an insulator; (3) as a preservative of insulation. Other than special insulating oils do not have these properties. They are not good cooling mediums; they frequently contain considerable moisture and, finally, they are likely to destroy insulation rather than preserve it. A test for moisture in transformer oil may be made as follows: Heat the end of an iron rod to a bright red heat and plunge it into the oil. If a puff of smoke ensues the oil will be known to contain no moisture: should a crackling sound follow, moisture will be known to be present. In the opinion of the writer, none of the oils mentioned should be used because they are not adapted for this class of work.—W. F. P., Atlantic, Mass.

Other answers on this subject will be published in a later issue.

New Appliances

Airdry Electric Towel—Outlet Plate and Hickey—New Switches—Electric Soldering Iron—Improved "Gun" Tap

Airdry, "Electric Towel," Is Big Aid to Disease Prevention.

The Groton Electrical Devices, Inc., Groton, N. Y., is advertising and pushing heavily the sales of Airdry, "The Electric Towel," an electrical appliance designed to eliminate towels in hospitals, factories, public washrooms of hotels, office buildings, department stores, banking offices, railroad depots, etc.

The machine consists of a white enameled iron standard, containing a motor, a fan, heating element, and an adjustable nozzle for directing the flow of the air. Mounted on the top of the casing is a 12 by 15 in. bevel mirror. Airdry is operated by pressure on a foot pedal.

The machine is equipped with a General Electric motor, that operates the fan and heating coils on a consumption of 1⅓ kw. per hour, making the operation cost about three one-hundredths of a cent, or far less than the cost of towels of any description.

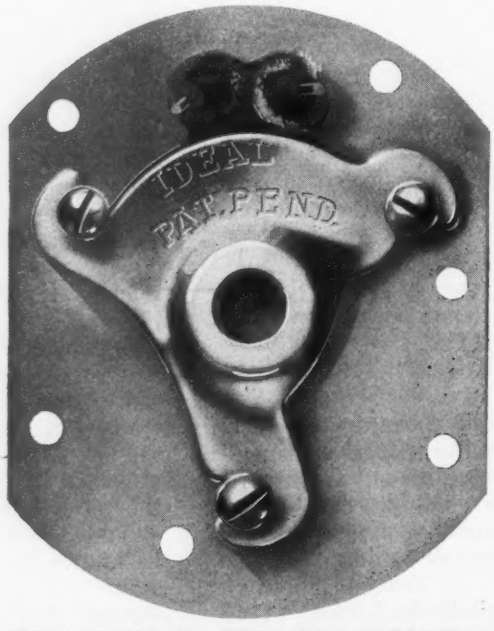
The warm air discharged from the nozzle causes evaporation and dries the skin thoroughly in 30 seconds, without the possibility of chapping hands or face. Airdry is 100% sanitary. Towels of all kinds, when used in public lavatories, are far from sanitary, even when laundered by most modern methods. Airdry will accomplish its purpose in a most thorough manner, and without danger of transmision of disease germs. The machine can be installed wherever electric current is available. It occupies but little space and adds to the appearance of any lavatory and does away with the littering of the floor with used towels, either paper or linen.

Besides its availability for use in public lavatories it can be used in barber shops, hair-dressing parlors, being especially adapted for complete and speedy drying of women's hair. The machine is simply constructed of standardized electrical units and even for usage in public places the machine is not easily put out of commission. The company is now putting on an extensive newspaper advertising campaign.

Combination Outlet Plate and Hickey for Knob-and-Tube-Wiring.

In installing knob-and-tube wiring systems much time is lost and energy wasted in trying to secure a satisfactory construction at outlets. To overcome this, special outlet plates have been developed. A new and ingenious device of this kind is the "Ideal" outlet plate manufactured by the Sterling Manufacturing Co., Erie, Pa. This consists of two parts, the outlet plate proper, which is made of stiff steel with an opening of special shape punched near one edge, and a combined hickey and crowfoot.

This device is designed to be used in place of backboards or fixture blocks in wiring old buildings. The back plate is first secured to the lathing of the wall by means of screws through properly spaced and ample screw holes and this serves as a protection to the plaster while the opening in the plaster is being made. The loom ends protecting the wires are then brought through the wall and plate opening. Finally the combined hickey and crowfoot, which acts as a damp on the loom ends, is secured in place by means of the three screws shown engaging the notches in the projecting lugs. In the position shown the loom ends are wedged by the thick side of the hickey. If four loom ends are to be clamped, it is necessary merely to turn the hickey through 120 deg. to the right to secure similar clamping action from the thin side of the hickey. The hickey as now made is provided with a set screw for securely holding the fixture stem in place. Thus the whole installation of an outlet is made in very short time, with little labor and in a very substantial and workmanlike manner.



"Ideal" Combination Outlet Plate and Hickey for Economical Installation of Loomed Outlets in Finished Buildings.

Rigid tests of the device made by Underwriters' Laboratories showed that the device could be properly installed and holes for the wires cut without injury to the plaster at the edges of the outlet. At least four of the wood screws for which holes are provided outside the hickey were found to engage with the lath in any position. A force of 25 lbs. applied at right angles on the fixture stem 1 ft. from the hickey was found to have no effect on the rigidity of the device, nor to make any damage to the plaster.

From this it is evident that the "Ideal" outlet plate for straight electric fixtures eliminates the use of troublesome backboards and fixture blocks. It provides a rigid and dependable mounting of the fixture in all cases and is especially serviceable for the easy and quick hanging of close-canopy fixtures.

New Types of Ceiling, Tumbler and Heavy Snap Switches.

A new development in the ceiling type of pull switch has been perfected by the General Electric Co., Schenectady, N. Y. This switch is so designed that it may be attached to the wall, instead of the ceiling, which is desirable in many cases. The mechanism is especially designed for the switch and is not merely an 'adapted' snap movement. The operating mechanism is primarily an eight-tooth ratchet, insuring quick and positive action, which is actuated by a pulley, whose shaft by being parallel with the base allows a straight pull. All the parts are solidly constructed to withstand the abuse that such a switch is bound to receive in the course of every-day service.

Very solid construction, compactness and quick, reliable operation are features of a tumbler switch for use on vacuum cleaners, washing machines and other household appliances which has also been developed by the General Electric Co. The switch has a very heavy nickel cover, rugged porcelain base, and the handle is of very strong compound. The construction is of sufficient strength to permit of the switch being operated by foot, and such operation is

further facilitated by the fact that the knob is knurled to prevent the foot from slipping. It is rated respectively at 3 amperes, 250 volts, and 5 amperes, 125 volts.

A new double-throw, double-pole, snap switch has likewise been perfected by the company. It is rated at 20 amperes, 250 volts. The construction of this switch resembles that of all snap switches as far as externals are concerned and, like them, it is indicating. The switch gives the same control of circuits as the ordinary double-throw, double-pole knife switch, but the inclosed feature, large capacity and indicating apparatus are advantages which should speak for themselves.

Electric Soldering Iron Features Safety Handle.

The ordinary gas heated type of soldering iron is as a rule anything but economical, either from a standpoint of time or of material. It requires continual reheating, since it chills very quickly from radiation, and nearly every time it is reheated the tinning is destroyed. The electric iron, once heated, remains hot as long as it is needed, but it does not become so hot as to oxidize the tinning or the copper. In fact, the point is "calorized," or given a special heavy coating to protect the copper from oxidation.

Due to the fact that it does lose heat rapidly, the average soldering iron is made with a very large, heavy copper element, usually none too securely fastened on an iron rod, with a light wooden handle. The consequence is that it is awkward and tiresome to use, has no balance, and, for working in corners or similar places, it is, for anyone except a really skilled operator, a source of considerable annoyance.

The new electric soldering iron manufactured by the General Electric Co. has a handle that consists of a spiral of heavy wire, which gives a certain degree of flexibility and at the same time gives the iron a good balance and a firm connection to the copper section.

This handle tends also to overcome in a measure the attendant fire risk of the gas heated iron. Gas flames are subject to blowing back, and thus causing fires; or even exploding, and the average fuel burning muffle is at best smoky, inconvenient and far from economical. The iron itself, if laid down on a bench, or the like, has the hot copper in direct contact with the wood of the bench, and, owing to its unbalanced construction, has a tendency to roll off onto the floor, where it may easily start a fire. On the other hand, the electric iron can be quickly attached to any lighting circuit and its constant heat is assured. The spiral handle is expanded into a guard ring where it joins the tip, that has the effect of raising the hot part in the air when the iron is laid down, thus preventing it from setting anything on fire. In fact, from the standpoint of safety, convenience in handling and economy of time and material, the electric iron is immensely superior for light or intermittent work such as is done in automobile repair shops and garages to the fuel heated type, or in residences where inflammable material is usually present.

Greenfield "Gun" Tap Makes Use of Shearing Cut.

Whether one shaves himself or goes to the barber, one knows that no matter how clean the razor is it is bound to scrape and pull unless it is held on an angle so as to give a shearing or slicing stroke. Application of this principle to the field of mechanics has been common, as in the lawn-mower blade and the scissors, but up to the advent of the new G. T. D. "Gun" tap none of the attempts to apply it to internal threading had been commercially successful. Recognizing the advantages of the shearing cut, the Greenfield Tap & Die Corp., Greenfield, Mass., set about the solution of this elusive problem, and after many experiments succeeded in perfecting a tap incorporating this principle.

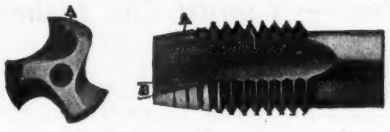


Fig. 1.—End and Side Views of "Gun" Tap, Showing Construction That Gives Shearing Cut.

The secret of this tap's phenomenal success lies in its radically different design, shown in Fig. 1. Cutting edges *A* at the point of the tap are ground at an angle *B* to the axis for a distance of three or four threads. This angle, in conjunction with the extraordinary hook of the land and special flute form, produces a long curling chip similar to that of a well-ground lathe tool. This chip is not passed out through the flute as in the ordinary tap, but shoots out ahead of the tool as it progresses, hence the name "Gun" tap.

Fig. 2.—Long Curling Chip Produced by the "Gun" Tap.

Owing to the fact that the flutes are not required for the passage of chips, they are made comparatively shallow, leaving a very large cross-sectional area. In fact, there is as much metal in the threaded section as in the shank. This accounts for the exceptional strength of the tap. All of the cutting is done by the first few teeth. The rest of the thread, acting as a lead screw, steadies the tap and produces very accurate work.

Fig. 3.—Another View of G. T. D. "Gun" Tap Showing Angular Cutting Edge.

The angular cutting edge with its pronounced hook shears the metal instead of tearing it off with a full face-on scrape. This shearing action completes the work with half the power required to drive the ordinary tap. Furtermore, it cuts a much cleaner thread in any material, whether it be lead or chrome-vanadium steel. Tests run in ten different metals varying from soft to hard have established the fact that the "Gun" tap will hold its size and lead in any material.

As the grinding is done only on the cutting edges, the tap will cut to size until it is ground down to the last three or four teeth.

The "Gun" tap is especially adapted to the quantity production of extremely accurate tapped holes. Inasmuch as the chips shoot ahead of the tap, it is imperative in blind-hole work to provide sufficient bottom clearance. Otherwise the chips jam into the end of the hole and stop the tap with disastrous results. A good general rule for blind-hole "Gun" tapping is to make the clearance equal one-quarter the depth of the hole. While this necessitates a little extra work for the drill, it is more than compensated for by the increased speed and accuracy of which the "Gun" tap is capable. For blind-hole work under the above conditions, or for all open-hole tapping, the "Gun" tap is claimed to be unexcelled. A catalog recently issued by the company gives fuller details of the new "Gun" tap.

Proper Light of Utmost Importance in Dental Work.

American Surgical Specialty Co., 6 East Lake street, Chicago, realizing that the value of sufficient light for dental surgery and diagnosis is a conceded necessity, is placing before dentists Cameron's Dentalamp, made in three shapes to give adaptability for any sort of use.

By reason of the special construction of Cameron's Dentalamp, it will furnish seven times the amount of light obtained from the average mouth lamp and will frequently enable the operator to make diagnoses that would not be apparent with the radiograph.

The straight Dentalamp is for examinations and operations with the detachable mouth mirror. By the use of this lamp it is possible to show the patient in the hand mirror the conditions in the mouth and makes it easy to convince them of the necessity of dental prophylaxis. The Right Angle Dentalamp is correctly curved for examination, transillumination and extraction of posterior teeth. The Antralamp is specially designed for illuminating the maxillary sinus. It is but 5 mm. in diameter and because of its coolness may be safely inserted through the opening in tooth socket directly into the antrum.

Cameron's Dentalamp can only be successfully used on the potential reductor unit furnished with the American Surgical Specially Co. Cool X-Raylite model.

American Surgical Specialty Co. handles a complete line of supplies for dental offices and are in a position to fill orders of any size on short order. A catalog describing all appliances handled by the company will be sent on application.

Trade Activities

Wellman-Seaver-Morgan Co. Urge Electricity for Car-Dumping Operation — Condit Co. Issues Switch Catalog

Stanley L. Polacheck, formerly with the Charles Polacheck & Brother Co., and later in the engineering department of the Milwaukee Electric Co., has opened offices in the First Wisconsin National Bank building, Milwaukee, where he will represent electrical equipment manufacturers in Wisconsin and the upper peninsula of Michigan.

Maher Engineering Co., 30 North Michigan avenue, Chicago, has opened a branch office at 708 Schofield building, Cleveland, O., for handling the distribution of Erie Engine Works engines, Dayton-Dowd Co. centrifugal pumps and Galland-Henning hydraulic presses. The Cleveland office will be under the management of Lincoln E. Maher.

Wellman-Seaver-Morgan Co., Cleveland, O., has just issued bulletin No. 49, giving views of a number of types of W-S-M car dumper, the bulletin showing illustrations and blue prints of the machines. Car dumpers are employed for discharging the contents of open top railroad cars by inverting the car sidewise and dumping the contents into boats, bins or storage yards. They are in general use on large coal shipping docks for discharging the contents of railroad cars into vessels; at blast furnaces for discharging iron ore into storage, and at coke oven plants for discharging coal into feed bins at the crusher house.

The conditions surrounding these equipments usually require an isolated boiler plant, which is operated with small regard for economy, non-condensing engines with inherent condensation losses being used. A larger force is also required than for an electric machine. One car dumper will usually handle from 3,000,000 to 4,000,000 tons in a year.

Electric power is used exclusively for the operation of movable car dumpers while the stationary turnover type is operated by either steam or electricity. Most of the lifting type of car dumpers are steam operated, although some installations have one or two of their functions electrified. There is, however, a growing tendency toward complete electrification of this type on account of greater operating economy.

Condit Electrical Manufacturing Co., South Boston, Mass., has issued in paper-covered bound form all bulletins and price lists sent out by the company during the past few years, making an interesting series of printed matter referring to the numerous types of oil switches, circuit breakers, transformers, induction and synchronous motor panels, protective relays and other electrical protective devices manufactured by the company. Full descriptions of the various devices for energy control from low voltage up to as high as 44,000 volts are given together with many illustrations showing the appliance as a whole and different sections thereof, as well as drawings showings dimensions and other data for reference purposes. Paul W. Koch & Co., 19 South Wells street, are Chicago representatives of the Condit company.

Standard Underground Cable Co. which has maintained an office in Detroit for several years under jurisdiction of the Chicago office, has made Detroit a full branch office with R. E. Green in charge. Mr. Green has been in charge of the Detroit office since it was opened, and has been connected with the company since 1909.

Pittsburgh Transformer Co. claims superiority over all other types for its pressed transformer bushing, a type that has been in service for 10 years and that, according to its makers, has given universal satisfaction. In this bushing there is no oil to leak, as in oil filled bushings, no tinfoil and rags to absorb moisture, as in the condenser type and no fragile porcelain to break.

Mitchell-Rand Manufacturing Co., 18 Vesey street, New York City, manufacturer of electrical insulating materials, is sending a distinct advertising novelty to the 8200 names on their mailing list. The new idea consists of samples of all armature twines in common use, the samples being tied on a sheet of cardboard, with the description of the particular twine given below the sample of the twine itself.

Rome Wire Co., Rome, N. Y., has just issued catalog No. 19, one of the most complete books of its sort ever sent out by a manufacturing concern. The catalog describes all varieties of hot-rolled copper and brass rods, copper and bronze wire, stranded copper power cables, polished copper piano covering wire, magnet wire, rubber insulated wires, house wires and flexible cords, telephone wires, packing house, canvasite and brewery cords, automobile, mining machine and deck cables made by the company, giving full details as to the construction of the different wires. In addition the price list per 1000 ft. is given on rubber-covered wires from a 14 to a 40 cent base. Beside telling all about the company's products the catalog also contains a mass of information of interest to all electrical dealers, contractors and engineers, including engineering data on the use of wire and its applications, data on wire tests, Underwriters rules and specifications for use of rubber-covered wire and lamp cord. There is also included in the catalog new tables showing the history of copper, as told in prices, the table showing the price of copper by months from 1888 to 1919, and other miscellaneous information of interest to engineers. The catalog is bound in a loose-leaf holder to allow for such additional bulletins that may be issued by the company.

Electrical Development & Machine Co., 221-227 North 23rd street, Philadelphia, Pa., announces the appointment of William T. Poulterer as engineer of the company. Mr. Poulterer for a number of years was engineer of the Philadelphia Electric Co. supply department. This company formerly acted as sales agents for the line of "Franklin" central station Specialties, manufactured by the Electrical Development & Machine Co., but since Jan. 1, 1920, the eastern territory has been handled by the Utility Products Co., 50 Church street, New York City, while the rest of the field is handled direct by the manufacturer. It is expected that the change will be of considerable benefit to the central-station clients upon whom Mr. Poulterer has called, by reason of his closer association with factory matters, and he will still be available at all times to devote his energies to assisting them in any of their problems which may be solved by use of the "Franklin" line.

Shaw Insulator Co., 5 Kirk place, Newark, N. J., is sending to the trade a neat little booklet on Condensite and other molding compounds, the booklet also showing the wide variety of insulating and molding materials manufactured by the company. The policy of the Shaw company is to abstain from recommending any application of their products until it has gathered sufficient data to make sure of their practical merits. This involves some delay, but prevents disappointments, and insures a more correct use of the company's products. In plastic molding, points out the booklet, a piece of work can be made at one operation in which there are bosses or projections at any desired angle from any surface, square holes or round holes (threaded or plain) traversing the piece at any desired angle; also pieces containing inserts made of any desired metal, and, in fact, comprising work which if done by machine tools would require scores of operations, and involve an expense for jigs and other appliances greater than the cost of molds used in plastic molding. It is possible in many cases to substitute plastic molding materials for metal or other substances fabricated by machine processes, and with a resultant economy in cost as well as betterment of product.

Current News

News of Construction Activities and Business Opportunities

EASTERN STATES.

Andover, Mass.—Community Laundry Co. has broken ground for the construction of a new laundry plant, estimated to cost about $50,000. Considerable electrical and mechanical equipment will be required in connection with the work.

Lynn, Mass.—General Electric Co has awarded a contract to Charles W. Wright, 23 Central avenue, Lynn, for the construction of the proposed new 3-story addition to its plant on Western avenue. The structure will be about 60 by 100 ft.

Springfield, Mass.—In connection with the proposed extensive expansion at the West Springfield plant of the Gilbert & Barker Manufacturing Co., contract has been awarded to A. E. Stephens, 145 State street, Springfield, for the construction of a new power plant and alterations in the existing building.

Worcester, Mass.—American Steel & Wire Co., Grove street, has had plans prepared for the construction of a new brick and concrete building to be located at 90 Prescott street. The structure is estimated to cost about $7,000.

Bridgeport, Conn.—United Illuminating Co. has completed plans for the erection of a new plant on property recently acquired on the east side of the harbor, formerly held by the Farist Steel Co. Westcott & Mapes, Inc., New Haven, are engineers for the company.

Derby, Conn.—Derby Gas Co. has awarded a contract to M. A. Durrschmidt, Derby, for the construction of a new addition to the boiler plant at the company's electric light station. The structure will be 2-story, brick, concrete and steel, about 40 by 100 ft.

Batavia, N. Y.—Genesee Light & Power Co., 40-42 Ellicott street, has had plans prepared for the construction of a new addition to its electric plant located in the town of Byron, Genesee county. The company has filed application with the Public Service Commission for permission to erect the structure, as well as for approval of a franchise granted by the local officials.

Bath, N. Y.—Town officials have approved an appropriation of $30,000 to be used for the construction of a new municipal electric light and power plant.

Binghamton, N. Y.—Binghamton Light, Heat & Power Co. has completed the installation of a new turbine unit at the Johnson City works, and is planning to inaugurate work at once on the installation of new boiler equipment. The company has been awarded a contract by the Universal Can Co. for the furnishing of additional electric energy in connection with the proposed expansion of the company at its Binghamton plant.

Bronxville, N. Y.—Village Investing Co. is considering plans for the construction of a new 1-story brick power plant, about 26 by 30 ft., to be located on Fairfield Road. The structure is estimated to cost about $20,000.

Brooklyn, N. Y.—Considerable electrical and mechanical equipment will be required in connection with the proposed construction of the new 4-story brick extension to the plant of the Cascade Steam Laundry, Inc., 835 Myrtle avenue. The work is estimated to cost about $150,000.

Buffalo, N. Y.—Taber Pump Co., 291 Elm street, manufacturer of pumping equipment, has filed notice with the Secretary of State of an increase in its capitalization from $100,000 to $200,000 for expansion.

Buffalo, N. Y.—United States Government, Bureau of Yards and Docks, is taking bids for the construction of a new local radio building until February 18, to be located on property adjacent to the lighthouse department grounds. The structure will be two stories in height.

Buffalo, N. Y.—Niagara & Erie Power Co., Marine Bank building, has had plans prepared for the construction of a new electric light and power plant for increased operations. Application for the necessary permission has been filed with the Public Service Commission.

Geneseo, N. Y.—Geneseo Gas Light Co. has filed schedule with the Public Service Commission of an increased rate for electric light and power, as well as gas service.

Hornell, N. Y.—Arrangements have been completed by the Hornell Electric Co. whereby electric energy will be furnished practically to the entire Cohocton Valley from the Hornell plant, including the towns of Wallace, Cohocton, Avoca, Naples, North Cohocton and Atlanta. The company has secured rights of way for the construction of a trunk line from Hornell to Wallace, a distance of about 30 miles, and it is proposed to commence work on the construction of the line as soon as weather conditions permit.

Jamestown, N. Y.—Crescent Tool Co., 200 Harrison street, is having plans prepared for the construction of new extensions to its plant for increased capacity. The work includes the erection of a new forge shop and power plant for general works service.

Medina, N. Y.—Approval has been granted the Western New York Utilities Co. of Medina, by the Public Service Commission, for the construction of an electric lighting plant in the town of Clarendon, Orleans county, under a franchise granted by the town authorities.

Montour Falls, N. Y.—Shepard Electric Crane & Hoist Co., manufacturer of electric traveling cranes, hoisting machinery, etc., has been reorganized with a capitalization of $1,250,000, being a consolidation of the old company of the same name and the Montour Hoist Corporation, of Elmira.

New York, N. Y.—Interborough Rapid Transit Co., 165 Broadway, has completed arrangements for the erection of its new power plant to be located on the west side of Westchester, near St. Peters avenue. The structure is estimated to cost $50,000.

New York, N. Y.—Petroleum Heat & Power Co., 511 Fifth avenue, will occupy the new 3-story reinforced concrete boiler and pumping building, about 30 by 40 ft., to be erected on 51st street, near Beekman place, at a cost of about $51,000.

New York, N. Y.—Standard Oil Co., 26 Broadway, has awarded a contract to the T. Curtis Woodruff Co., 213 10th street, Long Island City, for the construction of the proposed new pumping plant on Calyer street, near Kingsland avenue, Brooklyn, estimated to cost $15,000.

New York, N. Y.—Announcement has been made that the Westinghouse Lamp Co., 165 Broadway, has awarded a contract to the Stone & Webster Engineering Corporation for the construction of extensive addition to its plant at Milwaukee, Wis. It is said that the company is considering plans for extensions in a number of its other works.

New York, N. Y.—New York Telephone Co., 15 Dey street, has completed the erection of its new telephone building at 167th street and Grand View place. The company is also making rapid progress on the construction of its new buildings on Trautman street, near Rowland street, estimated to cost $220,000; and the addition at 208-16 East 79th street.

New York, N. Y.—The D. & D. Electric Co., 53 West 3rd street, has filed notice with the Secretary of State of the dissolution of the concern.

New York, N. Y.—Radium Luminous Materials Co. has completed negotiations for the leasing of property at 33 Park place, for a new establishment.

New York, N. Y.—Rialto Electrical Co., electrical contractors and constructors, have moved into their new quarters at 77 West 46th street.

New York, N. Y.—In connection with the generation of a total of about 1,250,000 horsepower daily at the plant

of the United Electric Light & Power Co., it is interesting to note that approximately 2000 miles of cables have been laid for its system.

Oswego, N. Y.—Fire on February 1 destroyed practically all of the rolling stock of the Oswego Traction Co., with total loss estimated at approximately $200,000.

Portville, N. Y.—Portville Cattaraugus County Utilities Co. has been granted permission by the Public Service Commission, Albany, to construct its new electric light and power plant. The company has been granted a franchise by the local officials.

Syracuse, N. Y.—Syracuse Lighting Co., 339 South Warren street, has been granted permission by the Public Service Commission to issue notes for $500,000, the proceeds to be used to cover a portion of the proposed 1920 expansion work of the company. This entire work, when completed, is estimated to cost $750,000.

Syracuse, N. Y.—Application has been filed with the Public Service Commission, Albany, by the Iroquois Utilities, Inc., 514 City Bank building, for permission to construct an addition to its electric plant for increased service. The company has been granted a franchise by the local authorities.

Atlantic City, N. J.—City has had plans prepared for the installation of a new double-circuit system of street lighting on the Absecon-Atlantic City boulevard.

Boonton, N. J.—Board of Aldermen is arranging for the awarding of a contract to the Boonton Gas-light & Improvement Co. for furnishing lighting standards for the street-lighting system.

Elizabeth, N. J. — Arrangements have been completed for the acquirement of the Waclark Wire Co., Bayway and South Front streets, by the American Copper Products Co., a new organization. It is understood that the new owner will continue the operation of the works for the production of copper wire, etc., with plans for general expansion. George E. Matthies and F. S. Jerome, president and vice-president, respectively, of the new company, are connected with the Seymour Manufacturing Co., Seymour, Conn. William F. Heroy is treasurer, and William J. McMillan, secretary.

Glassboro, N. J.—Plans have been arranged by the State Board of Education for the construction of a 1-story power plant, about 40 by 75 ft., to be erected in connection with the proposed 3-story State Normal school estimated to cost $350,000.

Hackettstown, N. J.—Hackettstown Telephone & Telegraph Co. has filed application with the Board of Public Utility Commissioners for permission to increase its rates for service.

Newark, N. J.—Mountain Ice Co. has had plans prepared for the erection of additions to its plants at 113 Newark street, and 137-51 Murray street, for increased operations.

Newark, N. J.—New York Telephone Co. has had plans prepared for the construction of additions to its exchange plants at 59 Bloomfield avenue, and at Avon avenue, and Hunterdon street, to cost about $200,000 and $150,000, respectively.

Newark, N. J.—In connection with the construction of the proposed new plant of the Farmers' Feed Co., to be located in Passaic avenue, near Chapel street, plans are being prepared for the erection of a 1-story brick boiler plant, about 44 by 45 ft., to cost $13,650.

Newark, N. J.—General Lead Batteries Co., manufacturer of storage batteries, etc., is having plans prepared for the construction of a 5-story reinforced concrete factory building to be located at Lister avenue and Chapel street, Newark. The new works are estimated to cost about $150,000.

New Brunswick, N. J.—In connection with the construction of the new local plant of the Eastern Potash Corporation, 120 Broadway, New York, ground for which has been broken, large quantities of electrical and mechanical equipment will be required. The proposed works will comprise a total of 14 buildings, including lime kiln, 200 by 280 ft., with height of 42 ft., which kiln, when completed, will be one of the largest of its kind in the world; a new mechanical plant, consisting of machine shop, 100 by 200 ft., and steam-operated electric power plant, provided with watertube boilers and steam turbines. It is proposed to install a complete equipment of loading and unloading machinery, as well as hoisting and hauling apparatus.

Orange, N. J.—Miniature Lamp Co., 17-21 Day street, has had plans prepared for improvements in its works, to facilitate operations.

South River, N. J.—Board of Public Works is having plans prepared for the construction of a 1-story brick power plant, about 55 by 95 ft., to be used for municipal service. The structure, including equipment installation, is estimated to cost about $125,000. Goss, Bryce & Johnson, 55 Liberty street, New York, are engineers.

Trenton, N. J.—Crescent Insulated Wire & Cable Co., Olden and Taylor streets, has awarded a contract to the Trenton Home Building Co., 237 East State street, for the construction of the proposed new 1-story addition, about 50 by 132 ft., at Ginder alley and Olden avenue.

Vineland, N. J.—Board of Managers of the New Jersey State Institute for the Feeble-Minded has had plans prepared for the construction of a new 2-story cold storage plant and cannery, to cost about $30,000. Electrical equipment will be required.

Georgetown, Del.—L. L. Layton & Sons have completed negotiations for the purchase of the plant of John B. Wagamon, to be remodeled and improved into a cold storage plant. Considerable electrical and refrigerating machinery will be required in connection with the work.

Wilmington, Del. — Postal Telegraph Co., 714 Shipley street has arranged plans for the removal of its local offices to larger quarters in the new Casey building, 8th and Shipley streets.

Allentown, Pa.—Lehigh Industrial Power Co. has completed negotiations for the purchase of property held by the Lehigh Valley Railroad Co., comprising about 3575 square feet of ground along the right of way of the railroad company near Jordan creek, to be used, it is understood, for future expansion.

Allentown, Pa.—In connection with the construction of the proposed new ice storage plant of the Allentown Merchants Ice Co., Fifth street and Sumner avenue, considerable electrical equipment and refrigerating apparatus will be required. The new structure will have a capacity of about 5000 tons.

Catasauqua, Pa.—Arrangements have been completed by the Lehigh Valley Light & Power Co. for the improvements in the municipal electric street-lighting system, and work will be inaugurated at once.

Dalton, Pa.—Scranton & Binghamton railroad, Scranton, is having plans prepared for the construction of a new local reinforced concrete addition to its power plant, about 50 by 70 ft., estimated to cost $95,000, including equipment installation.

Hazleton, Pa. — Cranberry Creek Coal Co. is arranging plans for the installation of a quantity of electric-operated mining equipment in its Alliance colliery, Schuylkill county, in connection with proposed extensions in its mining operations.

Oil City, Pa. — Citizens Light & Power Co. has filed application with the Public Service Commission for permission to operate under a new increased schedule of rates for service, effective February 26.

Philadelphia, Pa.—City has recently passed an ordinance approving an appropriation of $52,000,000 to be used by the Department of City Transit for improvements and new construction of the transit lines throughout the city.

Philadelphia, Pa.—John Blood & Brothers, Trenton and Allegheny streets, has had plans prepared for the construction of a new boiler plant in connection with the erection of the proposed new factory and bleach house at Clearfield and Janney streets, estimated to cost $40,000.

Philadelphia, Pa.—City has awarded a contract to Charles H. Dading, Bellevue Court building, for the construction of the proposed superstructure of the new engine plant of the city to be located at Lardner Point, estimated to cost $43,000.

Wilkes-Barre, Pa. — Wilkes-Barre Light Co. has filed application with the Public Service Commission for permission to issue bonds for $1,000,000, a portion of the proceeds to be used, it is understood, for expansion.

Baltimore, Md.—Contract has recently been awarded to the Gas & Electric Co., Lexington building, for furnishing electric energy for the operation of the large candy manufacturing plant of the Frederick W. Lipps Co., Hollins street.

Baltimore, Md.—Considerable electrical and mechanical equipment will be required in connection with the construction of the proposed new lo-

cal plant of the Sterno Corporation, recently incorporated with a capital of $500,000 by interests connected with the United States Industrial Alcohol Co., the United States Industrial Chemical Co., and the Curtis Bay Copper & Iron Co., all of Curtis Bay. The new plant will be located in the Curtis Bay district, and will be devoted to the manufacture of alcohol burning devices for automobile service, electric heating and cooking devices, etc., and is estimated to cost in excess of $400,000. Patrick H. Loftus, William B. Tucker, and Stewart M. Seymour, are incorporators: Carl Haner, Jr., connected with the United States Industrial Alcohol Co., is active in the new company.

College Park, Md.—Board of Managers of the Maryland State College of Agriculture is having plans prepared for the construction of a new central-heating plant and conduit system as well as other work at the institution, estimated to cost $249,400.

Hagerstown, Md.—Plans are under consideration by the city officials for the construction of a new municipal electric plant. It is understood that bonds for $300,000 will be issued to provide for the work.

Fairmont, W. Va. — Monongahela Valley Traction Co. has been granted permission by the United States Engineers to construct a transmission line across the Monongahela river in the vicinity of Lock No. 14.

Wheeling, W. Va.—American Gas & Electric Co. has completed negotiations for the purchase of a tract of about 200 acres of land adjoining its plant in the Beech Bottom district, to be used as a site for the construction of about 200 homes. It is said that the new town will be named "Windsor."

Wheeling, W. Va. — Central Glass Works is considering plans for the installation of a new gas generating plant at its works of sufficient size to meet its requirements for manufacturing operations.

Kingston, N. C. — City is having plans prepared for extensions and improvements in the municipal electric plant. The proposed work is estimated to cost in excess of $100,000.

Cornelius, N. C.—The city has offered $10,000 electric light bonds for sale. Address J. B. Reading, mayor.

NORTH CENTRAL STATES.

Ashtabula, O.—City council will be asked to authorize bond issue of $300,000 for erection of power house.

Youngstown, O.—Capital stock of the Electric Steel Alloy Co. has been increased from $1,500,000 to $3,000,000, of which $2,000,000 will be issued, largely to take care of oversubscriptions. An organization is being developed and the company will begin work on a new plant in the spring.

Anderson, Ind.—Charles Brossman, consulting engineer of Indianapolis, who has been employed by the board of works to make a survey of the city lighting plant, will recommend a policy of development to meet the continued demand for electric power in the future.

Evansville, Ind.—Sunbeam Electric Manufacturing Co. has increased its capital stock from $250,000 to $275,000.

Fairview, Ind.—Fairview Co-operative Co., Hamilton Co., has changed its name to Atlanta Telephone Co.

Hammond, Ind.—LaSalle Steel Co. has purchased 31 acres of land on the Indiana Harbor Belt, and Elgin, Joliet & Eastern railroads, and will erect a plant that will employ 800 to 1000 people. The new buildings will be of steel, glass, and concrete, built in three units, with about 800,000 sq. ft. of floor space under roof.

Indianapolis, Ind. — Armstrong Transfer & Trucking Co. will begin work Mar. 1 on a concrete warehouse and transfer building, 8-stories in height, 152 by 292 ft. The contract calls for the largest concrete building in Indiana.

Washington, Ind. — Improvements to the municipal lighting plant costing between $60,000 and $70,000 are contemplated by the city council.

Chicago, Ill.—Improvements to cost $400,000 are planned by the Monighan Manufacturing Co. on a 5-acre tract at Kilpatrick avenue and the Belt Line railroad. The first unit to be erected will cover 70,000 sq. ft., the main building to be 504 by 110 ft. The company, now located at 2036 Carroll avenue, has outgrown its present quarters.

Norris City, Ill.—The Ohio Valley Electric Co. will install an additional unit in its generating station here. A 2300-volt, three-phase, 60-cycle generator of 25 to 75-kw. capacity, with fuel-oil engine to operate same, will probably be purchased. The company should be addressed at its main office in Paducah, Ky.

Peoria, Ill.—Bock and Kuhl plan the erection of a 12-story building.

Detroit, Mich.—Yawman & Erbe Manufacturing Co., metal cabinets, has had plans drawn for a plant addition 100 by 260 ft.

Detroit, Mich.—Atlas Iron Works is reported planning a fabricating shop addition, 1-story, 90 by 120 ft., to cost $30,000.

Frankfort, Mich. — Ramiro Evans, manager of the Benzie County Power Co., which has a dam on the Benzie river, near Benzonia, has received plans and specifications for the installation of additional turbines and dynamos which will double the capacity of the plant.

Litchfield, Mich.—Citizens at recent special election voted in favor of issuing $12,000 in bonds for electric lighting plant.

Green Bay, Wis.—The Peninsular Power Co., with $100,000 capital stock, has been organized to furnish light and power over lines extending from Green Bay to Kewaunee, Algoma, Sturgeon Bay, and intermediate points. Construction will begin at once.

LaCrosse, Wis. — Architect Arthur Peabody is making specifications for lighting fixtures for the State Normal school. Address Board of Control, State Normal school.

Racine, Wis.—Plans have been filed by the J. I. Case Plow Works Co. for two large new casting shops to serve both the Wallis tractor division and the Case plow department. The malleable foundry will be 150 by 300 ft., estimated to cost $110,000. The grey iron foundry will be 130 by 360 ft., and cost $120,000.

Racine, Wis.—Approximately 40,000 sq. ft. of manufacturing space is being added to the plant of the Harvey Spring and Forging Co. by a 2-story shop, costing $35,000.

Tomah, Wis. — Tomah Light & Power Co. will let contracts on bids for erection of buildings of brick and concrete construction to cost $35,000. Address L. W. Barnes, manager.

Frazee, Minn.—L. M. Smith, Hill City, Minn., is contemplating the establishment of an electric light plant at Frazee.

Medford, Minn. — The Medford council has granted a franchise to the Prior Lake Electric Co. to install light and power.

Shevlin, Minn.—City contemplates the construction of a municipal electric light plant. Address John N. Desjardins, recorder.

Davenport, Ia.—Associated Masonic bodies plan the erection of a $1,000,000 temple.

Eldridge, Ia.—The Eldridge Mutual Telephone Co. has increased its capital stock from $15,000 to $25,000.

Fostoria, Ia.—City has granted a franchise to Charles A. Larson to establish electric light service.

Sloan, Ia.—The South Electric Co. has been formed to supply Sloan with lighting and heating power.

Hartville, Mo.—The Wright County Telephone Co. has been sold by Dr. W. A. Jones to Dr. N. J. Scott and Chester H. Duvall.

Kansas City, Mo.—Gate City bank will erect a 6-story reinforced concrete building, 50 by 129 feet. The plans, embodying a classical bank front, are based on a 10-story design.

Kansas City, Mo.—Mayor Cougill has petitioned the common council for a bond issue of $250,000 for improvements and new installation in the fire alarm system.

Manhattan, Kan. — The Wareham Telephone Co. will install a $100,000 plant.

Salina, Kan.—Standard Oil Co. will expend $175,000 in improvements in Salina this year. A new warehouse, office building and garage to cost $150,000, and two new service stations to cost $10,000, with a number of minor improvements, constitute the building program.

Lisco, Neb.—Fire practically destroyed the electric light plant owned by the Mitchell Motor Co. here recently, with a loss of $40,000.

Garretson, S. D.—The Co-operative Telephone Co. plans to erect a new building. Adolph Koch is manager.

McLaughlin, N. D.—The city has voted to install electric street lighting system. Address city clerk.

SOUTH CENTRAL STATES.

Benton, Ky.—Benton Light & Power Co. has awarded a contract to L.

F. Hardeman, Benton, for the installation of a new electric plant, estimated to cost about $10,000. W. L. Harrington is manager.

Georgetown, Ky.—The city will offer $100,000 bonds for sale Feb. 20 for the purpose of improving light, water, and fire apparatus. Address J. R. Humphreys.

Lexington, Ky.—Kentucky Utilities Co. has disposed of a bond issue of $3,000,000, a portion of the proceeds to be used, it is understood, for extensions and improvements.

Murray, Ky.—Plans are being arranged by the city for the installation of a new steam-driven generating unit in the municipal electric light plant, for increased operations. J. W. Stitt is manager.

Owingsville, Ky. — Owingsville Electric Light Co. is considering plans for the installation of a new electric generating unit at its plant, for increased service. E. V. Brother is secretary and manager.

Paris, Ky. — Paris Gas & Electric Co. is considering plans for the construction of a new 6600 volt transmission line, to extend about nine miles. C. L. Steenbergen is manager.

Chattanooga, Tenn. — Lookout Boiler and Manufacturing Co., recently incorporated with capital stock of $100.000 plans the construction of a building 100 by 200 ft.

Belzont, Miss. — Bonds to the amount of $275,000 have been voted for the purpose of adding to the lighting, water, and paving facilities of the city. The lighting plant will be improved and enlarged. Address Mayor, Belzont, Miss.

Little Rock, Ark. — Southwestern Bell Telephone Co. will expend $1,000,000 for extensions and improvements in Arkansas this year. M. Poage is general manager.

Clarendon, Ark. — The Clarendon Public Service Co. has been given 60 days in which to carry out the order of the Arkansas Corporation Commission to install additional generating units in its plant at Clarendon or to install a transmission line.

Star City, Ark.—City commissioners have granted the petition of the Star City Light Co. for the right to operate an electric lighting plant. A J. Johnson is president of the company, which is capitalized at $6000.

Stillwater, Okla.—A student branch of the American Institute of Electrical Engineers has been organized at the Oklahoma Agricultural and Medical college. Earl Gray is president, and J. C. Brown, vice-president.

Brownwood, Tex. — The construction of an electric power plant to operate waterworks, pumping station and furnish street lamps is being planned. Address E. R. Brashear, manager.

Cisco, Tex.—Cisco Gas & Electric Co. will expend $100,000 in extending its pole, wire, and fixture system and increasing facilities at the power house. The sum of $50,000 will be spent in the power house and a like amount in extending the outside equipment. P. W. Campbell is manager of the company.

Eastland, Tex.—Southwestern Telegraph & Telephone Co. will erect a 2-story brick exchange building and will install a switchboard with 8000 line capacity. The estimated cost is $25,000.

WESTERN STATES.

Denver, Colo.—The city of Denver won its suit in the United States Supreme court against the Colorado Public Utilities Commission which sought to increase telephone rates in Denver. The Supreme court by dismissing an appeal for want of jurisdiction allowed decisions of the Colorado Supreme court to stand, holding that the Denver Utility Commission, and not the state commission, had exclusive jurisdiction over telephone rates in the city.

Libby, Mont.—Extensive improvements will be made to the Libby Water & Electric Co. plant.

Wolf Point, Mont.—The Wolf Point Electric Light & Power Co. is being taken over by a newly-formed corporation of which R. J. Moore is president, C. O. Moore, secretary, and A. P. Tills, manager. The new company is capitalized at $100,000.

Kennewick, Wash.—Fred Berg and Arthur Wing have purchased the business of the Columbia Electric Supply Co. from W. H. Bryant.

Port Gamble, Wash. — Northwest Power & Manufacturing Co. has recently completed the installation of a new 3000 kw. outdoor substation in the Port Gamble district, to be used for the transmission of power in the Hoods Canal section and in the city of Bremerton.

Seattle, Wash.—In arranging the budget for the 1920 expenditures for additions and improvements in the municipal light and power system, Superintendent J. D. Ross, of the lighting department has estimated the cost of the proposed work at about $1,750,000. The improvements will include the installation of a new pipe line from the impounding dam at Cedar River to extend to the new power unit at Cedar Falls, estimated at $577,803; the erection of a new substation at Spokane street and East Marginal way, $225,000; transformer equipment, $50,000; additions to existing substations, $150,000; connection from Cedar river transmission lines to proposed substation at Spokane street, $30 000, as well as connection to the distributing station, $30,000; extensions in distributing system, $280,000; extensions in street-lighting system, $30,000; new feeders, $40,000, and other work. The city council has recently granted an appropriation of $330,000, to provide for the construction of the proposed new steam-operated electric plant to be erected at Cedar Falls.

Portland, Ore.—West Oregon Lumber Co. is electrifying its lumber mill at Linnton, Ore. For that purpose an Allis-Chalmers 2000 kw., 480 volt, three-phase, 60-cycle, 3600 r. p m. high pressure, condensing turbogenerator unit is being installed. It will be provided with Allis-Chalmers high-vacuum jet condensing equipment and a 7-panel switchboard. The electric energy will be conducted from the generator direct to the 480 volt motors. All the sawmill machinery will be electrified first and the band mill, edgers, loghaul and other machines later.

Fresno, Cal.—San Joaquin Light & Power Co. has been granted permission by the State Railroad Commission to issue stock for $3,500,000, the proceeds to be used for extensions and improvements in the company's plants and system. At the present time, rapid progress is being made on the construction of a new steam-operated electric plant at Bakersfield, estimated to cost about $950,000, as well as a new hydroelectric plant on the San Joaquin river to cost $45,000, and plans are under consideration for the construction of a new plant on Kings river to involve an expenditure of about $2,500,000.

Los Angeles, Cal.—Southern California Edison Co. has been granted permission by the State Railroad Commission to issue bonds for $7,500,000, to be used, in part, for expansion and for additional working capital.

Mentone, Cal.—South Mesa Water Co. is arranging plans for the immediate completion of its new waterworks system, estimated to cost about $40,000.

Newport Beach, Cal. — Southern California Edison Co. is arranging plans for the immediate construction of a new electric substation to be located at Newport Beach, estimated to cost about $20,000. The company is also having plans prepared for the construction of a new power line to extend to San Juan Capistrano. This latter work is estimated to cost $30,000.

Richmond, Cal.—Contract has been awarded to the Western States Gas & Electric Co., Richmond division, for furnishing electric energy for the operation of the new plant of the Atomizing Metals Co., nearing completion. It is proposed to inaugurate operations at the earliest possible date.

Riverside, Cal. — In arranging its expansion plans for 1920, the Holton Interurban Power Co. has made an appropriation of $1,500,000, to be used for improvements in its system in the Southern California district, including the construction of hydroelectric plants in the Imperial valley, and the sum of $200,000 to be used for the construction of a new power line extending to Blythe and Ripley in the Palo Verde valley.

Riverside, Cal. — Southern Sierra Power Co. has plans under consideration for the extension of its power lines from Niland to Blythe, for increased operations. The proposed work is estimated to cost in excess of $175,000.

San Francisco, Cal.—The lease of the properties of the Sierra and San Francisco Power Co. to the Pacific Gas & Electric Co., for 15 years, has been approved by the California State Railroad Commission. The total rentals for this period will be $2,000,000.

Stockton, Cal.—Considerable electrical and mechanical equipment will be required in connection with the construction of the proposed new plant of the Campco Tractor Co., an

organization recently perfected with a capitalization of $1,000,000.

Woodland, Cal.—City trustees have passed an ordinance providing for the installation of a new underground conduit system to replace the present overhead wires throughout the municipality. The ordinance provides that the work, which is estimated to cost in excess of $100,000, be completed before the close of the present year.

CANADA.

Belmont, Ont.—Citizens of the village of Belmont, Ont., recently visited the Hydroelectric Commission of Ontario seeking a supply of power for lighting purposes. The town is now dependent on natural gas and the supply has been very unreliable.

Kitchener, Ont.—W. O. Breithaupt, of the Kitchener-Bridgeport Electric Railway, has announced his intention of applying for a charter to construct an electric railway from Kitchener to Guelph.

Morden, Man.—A government survey party is at work on the proposed hydroelectric transmission line from Oakville to Morden, Man. This line is expected to take in the towns of Carman, Roland, Rosebank, Miami, Morden, Winkler, and possibly two or three other points.

St. Johns, N. B.—A preliminary survey is being made in connection with a proposed $500,000 power plant to be erected on Green river, Madawaska county, a few miles above St. Leonard's. Charles Brandies is consulting engineer.

INCORPORATIONS

Peoria, Ill.—Illinois Battery Steamer Co. has been incorporated with capital stock of $15,000 by Theodore Wissing and others.

LaPorte, Tex. — LaPorte Water, Light & Ice Co. has incorporated with capital stock of $13,000. P. J. Pfeiffer, H. R. Dean, and C. C. Triggs are incorporators.

Scooba, Miss.—Scooba Light & Power Co. Capital, $17,000. To operate a local electric light and power plant. Incorporators: E. L. Gilbert, G. C. Boyd, and Burt D. Gaillaird.

Kokomo, Ind.—Carter Electric Co., with capital of $30,000, has been incorporated to deal in electrical goods. The incorporators are Omer B. Carter, John W. Carter and Hugh H. Dungan.

Beckley, W. Va.—Best Electric Co. Capital, $20,000. To manufacture electrical goods. Incorporators: E. A. Hall, A. A. Peggs, and B. B. Hawley.

Newberry, S. C.—Newberry Electric Co. Nominal capital, $5000. To manufacture electrical supplies. Incorporators: John C. Goggans, Jr., and W. S. Cameron.

Oklahoma City, Okla. — Terminal Battery Co. Capital, $7500. To manufacture electric batteries. Incorporators: W. B. and T. R. Quarles, and L. M. Whetstone.

Springfield, Ky. — Springfield & Campbellsville Utilities Co. Capital, $150,000. To operate a local electric light and power plant. Incorporators: H. Thurman, L. A. Burns, and G. C. Wharton.

St. Pauls, N. C.—St. Pauls' Power Co. Capital, $250,000. To operate a local electric light and power system. Incorporators: A. R. McEachern, J. M. Butler, and W. D. Johnson.

Akron, O.—Vogel Electric Co. has filed articles of incorporation with capital stock of $10,000. Incorporators are L. W. Vogel, E. F. Vogel, H. C. Tinker, J. N. Mullen, and C. G. McElheey.

Louisville, Ky. — Mitchell Farm Light Co. has incorporated with capital stock of $5000. F. T. Mitchell, W. R. Heke, and Kendrick R. Lewis are incorporators.

Des Moines, Ia. — Edward-King Electric Co. has filed articles of incorporation with capital stock of $5000. Incorporators, Robert H. Edwards and C. C. King.

Snyder, Tex.—Owners of the Snyder electric light plant have filed articles of incorporation of the Snyder Utilities Co. with D. P. Loder, president; W. B. McCormick, vice-president, and Z. J. Anderson, secretary and treasurer.

Oilton, Okla. — Lenora Telephone Co. has incorporated with capital stock of $3000. Incorporators: J. B. Franzee and James W. Young of Lenora, and J. F. Beushauson of Webb.

Boyce, Ky.—Boyce Telephone Co. has incorporated with capital stock of $2500. Incorporators: S. E. Duncan, A. J. Justice, and J. B. Lightfoot.

Dixon, Ia. — Dixon Mutual Telephone Co. has incorporated with capital stock of $10,000. Louis Meier, president, and Henry Gew, secretary.

Cleveland, O.—Zeus Electrical Co. has incorporated with capital stock of $10,000. Incorporators: John Rein, L. J. Rieske, J. Hoek, Margaret Rieske, and G. W. On.

New York, N. Y.—Bozart Lighting Co. Capital, $30,000. To manufacture electric and gas fixtures, etc. Incorporators: D. Belitsky, F. M. Tesla, and J. S. Goldberg, 230 Grand street.

Brooklyn, N. Y.—Flatbush Battery Co. Capital, $5000. To manufacture electric batteries, etc. Incorporators: A. and E. M. Price, and W. L. Watson, 490 East 4th street.

New York, N. Y.—Moonlight Lamp Corporation. Capital, $5000. To manufacture electric light and gas fixtures, etc. Incorporators: S. Jaffe, M. and M. Rosen, 224 East 13th street.

Perth Amboy, N. J. — M. & M. Trading Co. Capital, $25,000. To deal in electrical appliances, etc. Incorporators: Fred Coriell, Julius Miller, and Isaac A. Meyers.

Johnstown, Pa. — Burnside Public Service Co. Capital, $5000. To operate a local electric light plant. L. B. Saylor is the principal incorporator.

Pittsburgh, Pa.—Hy Power Battery Manufacturing Co. Incorporated under Delaware laws with a capital of $10,000. To manufacture storage batteries, etc. Incorporators: R. C. Cain, T. J. Kuseman, James A. Brooks, Pittsburgh.

Philadelphia, Pa. — West Electric Hair Curler Co. Capital, $50,000. To manufacture electric appliances, etc. Incorporators: David L., Harold V., and S. A. Short, Philadelphia.

Charlotte, N. C. — Carolina States Electric Co., 218 West 1st street. Capital, $100,000. To manufacture electrical supplies. Incorporators: Eugene B. Long and H. T. Long.

Louisville, Ky.—Lyon-Nevitt Storage Battery Co. Capital, $5000. To manufacture storage batteries, etc. Incorporators: W. B. and C. T. Lyon, and W. A. Rhodes.

Tampa, Fla.—Electric Service Co. Capital, $30,000. To manufacture storage batteries, etc. Incorporators: J. F. Pierce, president, L. W. Todd, general manager.

Morris, Okla.—Great Western Electric Co. Capital, $250,000. To operate a local electric light and power plant. Incorporators: W. A. Wilson, C. J. Rogers, and H. G. Toomer.

Nitro, W. Va. — Nitro Power Co. Capital, $100,000. To operate a local plant for the generation and distribution of electric energy. Incorporators: W. D. Payne, J. F. Bouchelle, and S. P. Hopper.

Boston, Mass.—Cobb Electric Appliance Co. has been incorporated to make electric appliances. Capital stock, $50,000. Alonzo J. Shadman, Albert B. Cobb and George L. Ellsworth, of Brookline, Mass., are incorporators.

Reading, Mass. — Globe Phone Manufacturing Co. has been incorporated to make telephones and dictagraphs. Capital stock, $300,000. Albert G. Barber, Fred E. Bronson, and Walter C. Mooney are the incorporators.

Kalamazoo, Mich. — Warner Electric Co. has been incorporated by William S. Dewing and others to manufacture motors and machinery. Capital stock, $14,000.

Toronto, Ont.—The Apex Electric Manufacturing Co., Ltd., has been incorporated to manufacture electric machinery, etc. Capital stock, $10,000. Raymond L. Hughes, Ralph B. Gibson, and others are incorporators.

Toronto, Ont.—R. E. Callahan, Ltd., has been incorporated to manufacture electric machinery, etc., with capital stock of $350,000. Jacob H. Greenberg, Walter G. Hammond, and others are incorporators.

PROPOSALS

Washington, D. C.—Bids will be received Mar. 10 for furnishing, as may be ordered from time to time, during the fiscal year beginning July 1, 1920, and ending June 30, 1921, for Class 15, incandescent electric lamps; Class 16, incandescent gas-lamps. Address, Secretary of the Treasury, Washington, D. C.

Personals

R. T. Lozier Returns to Engineering Work—E. G. Drew Secretary of Chicago Telephone Co.—Changes in Personnel

ELBERT G. DREW has been elected secretary of the Chicago Telephone Co., to succeed Walter I. Mizner, who resigned to accept the secretary-treasurership of the Michigan State Telephone Co. Mr. Drew has been in the service of the Chicago company for 30 years. Upon leaving high school he became a telegraph operator and train dispatcher for the Chicago & Eastern Illinois railroad. In 1890 he came under the observation of W. E. Bell, now commercial superintendent of the American Telephone & Telegraph Co., and started in the latter's office as a stenographer. He has since held the positions of chief clerk, claim agent, right of way agent, supervisor of suburban exchanges and purchasing and supply agent. In 1900 he was transferred to the accounting department as assistant auditor and for the past nine years has been in charge of the revenue accounting work of the company. Mr. Drew was among the pioneers in the field of promoting comradeship among employes, establishing one of the first employes' benefit associations in the telephone industry. This organization was later merged in the benefit plan of the Bell system. He is a lover of art and an artist of recognized ability, having studied at the Art Institute and one of his landscapes has

Elbert G. Drew.

been accepted and placed on exhibition in the "Chicago Artists' Show," now going on at the Institute. Mr. Drew has been active in civic affairs in Evanston, where he resides at 825 Milbourne street, and is president of the Lake Shore Neighborhood club. Mr. Drew's family consists of two married sons and two daughters, one of whom is a student at Northwestern University and the other in high school.

GEORGE E. TAYLOR, Charleston, W. Va., chief engineer for the Public Service Commission of West Virginia, has resigned, effective Feb. 1.

H. A. SPARKS, recently made superintendent of the Xenia plant of the Robbins & Myers Co., Springfield, O., was formerly general manager of the Simplex Machine Tool Co., Columbus, O.

EDWARD W. WOLLMUTH, commercial manager of the New York Telephone Co. at Newark, N. J., has been appointed secretary of the Board of Trade, succeeding James M. Reilly, retired.

L. S. HARRISON, district superintendent of the General Electric Co., Trenton, N. J., recently presented an interesting address on "The Electric Propulsion of Ships" at a special meeting of the Trenton Engineers' Club, held in its club rooms.

F. M. NOURSE, for two years engineer in the advertising department of the Cutler-Hammer Manufacturing Co., Milwaukee, has joined the Charles L. Benjamin organization in Chicago. Mr. Nourse is a graduate in electrical engineering of the University of Illinois and worked for the Public Service Co. of Northern Illinois both before and after his graduation. The Benjamin organization makes a specialty of trade and technical advertising and Mr. Nourse's new duties will consist of preparing technical advertising and literature for its clients.

ROBERT TEN EYCK LOZIER, who for several years carried on a large practice as a consulting engineer in New York city, up to the time of the world war, when he became assistant executive assistant to the consulting engineer of the Naval Aircraft factory at the Philadelphia Navy Yard, has returned to New York and has opened offices in the Woolworth building. An initial event in resumption of work in the Metropolis is his retention as industrial consultant exclusively for a given period by the National Conduit & Cable Co. Beginning his career with the parent Edison electric light interests in New York city as far back as 1883, and directly associated with Mr. Edison in experimental and development work, Mr. Lozier has had a most unusual round of experience with the Sprague, Bullock, General Electric and other manufacturing electrical industries, including, since the signing of the armistice, special relations with the Standard Underground Cable Co. of Pittsburgh. Mr. Lozier has also enjoyed a large amount of practice in the technical-financial field, for example, as examining engi-

Robert Ten Eyck Lozier.

neer for the famous banking firm of Kountze Bros. Mr. Lozier's 37 years of successful business life have included all the larger aspects of administration, engineering production and marketing, so that the new era of reconstruction finds him ripely qualified to meet all the exacting demands of an ever-broadening field, with emphasis on definite ideals and methods that have become generically known under the name of the "Lozier Plan."

OBITUARY.

CARL ORT, a radio engineer in the research department of the American Radio Co., New York city, died Feb. 1 at the Mount Sinai hospital, following an attack of pneumonia, aged 35 years.

HOWARD JOSLYN, city electrician for Seattle, Wash., for 15 years, died at his Edwood farm, on Lake Washington, Jan. 15, of pneumonia. He was a member of the American Institute of Electrical Engineers, and of the Northwest Society of Engineers.

ROY N. STROHN, vice-president of the Western United Gas & Electric Co., Aurora, Ill., died on Jan. 23 after an illness of one week of influenza followed by pneumonia at the age of 46 years. Mr. Strohn was one of a committee of five men selected by Stanley Field of Chicago to go overseas in 1917 at their own expense to direct the finances of the American Red Cross, and served as purchasing agent for the Red Cross in London. He was a director of the Union League Club of Chicago and the Aurora Country Club.

For the Readjustment Period—What?

The Conquest of Markets

Ancient Cathay and wealthy India were once the markets of the world. Rival merchants drove richly laden caravans across the deserts of Arabia. They chartered ships and hired adventurous seamen to find a shorter route to the coveted markets. Their efforts opened a New Era.

Today, another New Era dawns on a whole world of waiting markets. They lie at our very doors.

Old standards have been swept away. Buying power has experienced a complete upheaval. The wealth of America's markets alone dwarfs that of ancient India.

To these markets Scientific Advertising is the "Open Sesame."

Its peaceful conquest marshals a power mightier than any army. Its printed word is more potent than the keenest sword.

Scientific Advertising is adequate, intelligent, honest application of proved laws and principles. It avoids meagerness of plan as it avoids mediocrity of execution. It shuns superficiality.

The success of its conquest depends on the experience, the ability, the character of those who wield its power. Its practice demands work.

The conquest of markets, through such scientifically correct means, brings in its train lasting benefit to manufacture, to dealer, and to consumer.

JOHNSON, READ & COMPANY.

This expression from a progressive Chicago advertising agency is reproduced here because of its suggestive value. Think it over.

C. A. TUPPER - - - - President
INTERNATIONAL TRADE PRESS, Inc., Chicago

Financial News

General Gas & Electric's Operating Shows Healthy Increase.

Combined operating revenues of subsidiary and affiliated companies of General Gas & Electric Co. showed a gain for the company's last fiscal year of $1,062,000. Operating revenues for the year ending Oct. 31, 1919, were $8,837,512. Operating expenses, taxes and rentals were $6,219,463, an increase of $296,236, indicating that nearly 70% of the expansion in revenues was conserved for operating income. Operating income was $2,618,049, against $1,851,640 for the previous year, a gain of more than $766,000, or 41%.

The strongest feature of the advancing revenues is the fact that 66% of 1919 operating revenues were derived from electric light, power and gas. This is an upward tendency in revenues from this source, which is a desirable feature just now, in view of the hardships being experienced by street railway companies.

A comparison of earnings of the subsidiary companies in the last four years, ending Oct. 31, 1919, is shown below:

	1919.	1918.
Operating revenue	$8,837,512	$7,774,867
Operating expenses, taxes and rents	6,219,463	5,923,226
Operating income	$2,618,049	$1,851,641
	1917.	1916.
Operating revenue	$6,425,159	$5,515,197
Operating expenses, taxes and rents	4,799,884	3,813,633
Operating income	$1,625,275	$1,701,565

Gain in electric business was responsible for $548,721 of the increase in gross in 1919, indicating the effect of the demand for power by big industrial companies. Residential lighting was the main factor of the electrical business a few years back, but this has been supplanted by the demand from big power consumers.

American Gas & Electric.

An advance statement of American Gas & Electric Co. earnings for November and the 12 months ending Nov. 30, last, show an increase of 21% gross, 36% net and 245% balance after interest charges for November. Net earnings for the 12 months, ending Nov. 30, 1919, increased 136%, while gross of balance, after interest charges, amounted to 138%.

Southern California Edison.

Southern California Edison Co. for the year ended Dec. 31, 1919, shows surplus after charges, but before depreciation of $2,983,183, as compared with surplus of $2,443,465 in the preceding year.

Income account for the year ended Dec. 31, 1919, compares as follows:

	1919.	1918.
Gross revenue	$9,241,246	$7,452,937
Other income	1,328,319	1,282,521
Total income	$10,569,565	$8,735,458
Operating expenses	4,480,321	3,348,424
Net income	$6,089,244	$5,387,034
Interest charges, etc.	3,106,061	2,943,569
Surplus	$2,983,183	$2,443,465

February Big Dividend Month.

A total of $164,621,464 will be paid to investors in dividends and interest disbursements during the current month, compared with $156,129,132 in February, 1919. Stockholders will receive $78,121,464, compared with $75,229,232 a year ago. Industrial corporations will have paid in dividends during the first two months of 1920, $109,680,775, compared with $103,750,622 for the corresponding period in 1919, according to The Journal of Commerce tables.

Consolidated Gas Wants $15,000.000.

Consolidated Gas Co. of New York has filed application with the Public Service Commission for permission to issue new securities for $15,000,000, the proceeds to be used for the purchase of securities to be issued by a number of its subsidiary organizations, applications for which will also be filed with the Commission. The companies and amounts to be issued are: Westchester Lighting Co., $3,390,000; United Electric Light & Power Co., $8,825,000; New York & Queens Electric Light & Power Co., $3,400,000; Union Gas Co., $450,000, as well as smaller amounts.

Northern Texas Electric Co.

Earnings of Northern Texas Electric Company for December and 12 months ended Dec. 31, 1919, compares with 1918 as follows:

	1919.	1918.
December gross	$ 329,940	$ 249,511
Net earnings	136,244	91,932
Surplus after charges	111,380	67,573
12 months' gross	3,387,854	2,929,759
Net earnings	1,352,937	1,160,927
Surplus after charges	1,053,503	858,580

Dividends.

The Federal Utilities Co. declared the regular quarterly dividend of 1½% on the preferred stock, payable March 1 to holders of record Feb. 14.

The Electric Investment Co. declared the regular quarterly dividend of 1¾% on the preferred stock, payable Feb 21 to holders of record Feb. 11.

Brooklyn Edison Co. Shows Gain of 26,262 Customers in 1919.

Annual report of the Brooklyn Edison Co., Inc., just made public, shows that though the company met with many difficulties and problems during 1919, due to readjustments following the World War, all of them were successfully solved and the company had the best year in its existence. An extensive new business campaign resulted in the greatest amount of new business ever obtained in the company's history, contracts being signed for upwards of 67,000 hp. much of which is used by customers whose private plants were replaced by Edison service. The company had 125,524 customers on Dec. 31, 1919, an increase of 26,262 over the year previous.

The financial results for the year are shown, in condensed figures, in the following statement, of earnings and expenses:

	1919.	1918.	1917.
Total revenue	$10,850,114.52	$ 8,854,302.14	$ 8,381,055.25
Expenses including taxes and reserves for renewals and replacements	7,499,102.49	6,162,445.58	5,511,982.25
Gross income	$ 3,351,012.03	$ 2,691,856.56	$ 2,869,073.00
Contingencies, reserve	456,149.68	199,620.06	596,704.14
	$ 2,894,862.35	$ 2,492,236.50	$ 2,272,368.86
Interest and discount	$ 1,088,448.65	$ 898,677.20	$ 802,710.78
Dividends, etc.	1,488,406.42	1,495,749.88	1,425,522.10
Surplus for the year	$ 318,007.28	$ 97,809.42	$ 44,135.98
*Adjustments, previous years	53,351.31	.....	59,463.68
Credit to profit and loss	$ 264,655.97	$ 97,809.42	$ 103,599.66
Stock outstanding Dec. 31	$17,306,300.00	$17,237,000.00	$17,156,500.00

*Deduction.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities.	Div. rate. Per cent.	Bid Feb. 3.	Bid Feb. 10.
Adirondack Electric Power of Glens Falls, common	6	14	14
Adirondack Electric Power of Glens Falls, preferred	6	78	78
American Gas & Electric of New York, common	10+extra	125	122
American Gas & Electric of New York, preferred	6	39	39
American Light & Traction of New York, common	..	190	180
American Light & Traction of New York, preferred	6	88	88
American Power & Light of New York, common	4	66	60
American Power & Light of New York, preferred	6	72	70
American Public Utilities of Grand Rapids, common	..	8	7
American Public Utilities of Grand Rapids, preferred	7	20	18
American Telephone & Telegraph of New York	..	99⅝	97¾
American Water Works & Elec. of New York, common	..	2	2
American Water Works & Elec. of New York, particip	7	6	5
American Water Works & Elec. of New York, first preferred	..	48	47
Appalachian Power, common	..	3	2
Appalachian Power, preferred	7	20	20
Cities Service of New York, common	extra	400	365
Cities Service of New York, preferred	6	71½	68
Commonwealth Edison of Chicago	8	107½	106½
Comm. Power, Railway & Light of Jackson, common	..	18	18
Comm. Power, Railway & Light of Jackson, preferred	6	41½	39
Federal Light & Traction of New York, common	..	7	6
Federal Light & Traction of New York, preferred	..	42	43
Middle West Utilities of Chicago, common	..	20	20
Middle West Utilities of Chicago, preferred	..	42	40
Northern States Power of Chicago, common	..	59	59
Northern States Power of Chicago, preferred	ex.div.7	87	87
Pacific Gas & Electric of San Francisco, common	..	55	51½
Public Service of Northern Illinois, Chicago, common	7	78	79
Public Service of Northern Illinois, Chicago, preferred	6	83½	88
Republic Railway & Light of Youngstown, common	4	14	17
Republic Railway & Light of Youngstown, preferred	6	44	45
Standard Gas & Electric of Chicago, common	..	25½	25
Standard Gas & Electric of Chicago, preferred	6	41	40
Tennessee Railway, Light & Power of Chattanooga, common	..	1	1
Tennessee Railway, Light & Power of Chattanooga, preferred	6	7	7
United Light & Railways of Grand Rapids, common	4	26	24
United Light & Railways of Grand Rapids, preferred	6	60	60
Western Power of San Francisco, common	..	21	21
Western Union Telegraph of New York	extra	86⅛	85
Industries.			
Electric Storage of Philadelphia, common	4	128	125
General Electric of Schenectady	8	166	156
Westinghouse Electric & Mfg. of Pittsburgh, common	7	53⅜	50¾